



ES Series

ES150P

Powered Subwoofer

## Service Manual



JBL Consumer Products

250 Crossways Park Dr.

Woodbury, New York 11797

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Discontinued XXXX

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## ES150P SPECIFICATIONS

Amplifier Power (RMS):	300 Watts
Peak Dynamic Power *:	500 Watts
Driver:	10" (254mm) PolyPlas™
Inputs:	Line Level (switchable to LFE)
Low-Pass Frequency:	Variable from 50Hz to 150Hz (24dB/octave, continuously variable)
Frequency Response:	27Hz – Low-pass crossover setting
Dimensions (H x W x D):	18" x 13-1/4" x 15-1/4" (457mm x 337mm x 387mm)
Weight:	39 lb/17.7kg

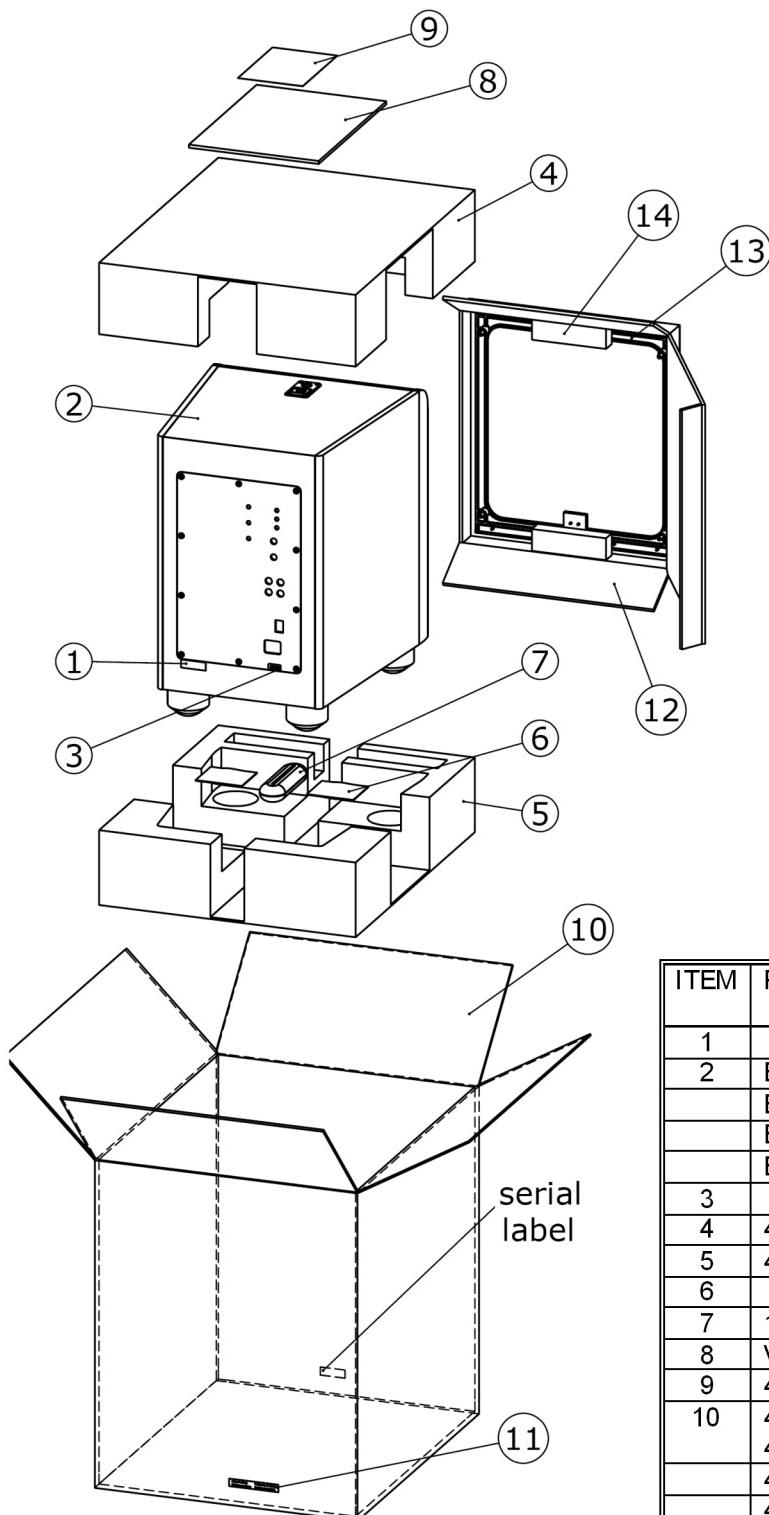
JBL continually strives to update and improve existing products, as well as create new ones. The specifications and details in this and related JBL publications are therefore subject to change without notice.

\* The Peak Dynamic Power is measured by recording the highest center-to-peak voltage measured across the output of a resistive load equal to minimum impedance of the transducer, using a 50Hz sine wave burst, 3 cycles on, 17 cycles off.

JBL ES150P 225W Powered Sub Amp					
<b>LINE VOLTAGE</b>	Yes/No	Hi/Lo Line	Nom.	Unit	Notes
US 120vac/60Hz	Yes	108-132	120	Vrms	Normal Operation
EU 230vac/50-60Hz	Yes	207-253	230	Vrms	Normal operation, MOMS required
<b>Parameter</b>	<b>Specification</b>	<b>Unit</b>	<b>QA Test Limits</b>	<b>Conditions</b>	<b>Notes</b>
<b>Amp Section</b>					
Type (Class AB, D, other)	D	n/a	n/a		
Min. Load Impedance (speaker)	4	Ohms	n/a	Nominal	
AVG System impedance	5.18	Ohms	Reference	AP Computed based on system impedance curve	Over the BW of 20 to 500Hz
Rated Output Power	225	Watts	210		
AVG RMS Dynamic Power	245	Watts	240		Average RMS power, 3/20 Cycles 50 Hz, Driven 6dB above its input sensitivity , average of the first 4 consecutive peaks
THD @ Rated Power	0.5	%	1	22k filter	
THD @ 1 Watt	0.2	%	0.3	22k filter	
DC Offset	10	mV-DC	30	@ Speaker Outputs	
Damping factor	>50	DF	20	Measured at amplifier board	Measured at the speaker cable. 189 Watts @ THD < 0.1 % @ 50 Hz
<b>Input Sensitivity</b>					
Input Frequency	50	Hz	50	Nominal Freq.	
L or R Inputs	11	mVrms	±1dB	To 1 Watt	Single input driven
LFE mode using L or R inputs	11	mVrms	±1dB	To 1 Watt	Single input driven, LFE switch ON
System Gain	45	dB	Reference		Single input driven Normal or LFE mode
<b>Signal to Noise</b>					
SNR-A-Weighted	80	dBA	75	relative to 1W	A-Weighting filter
SNR-unweighted	65	dBr	60	relative to 1W	22K filter
Residual Noise Floor	<2.0	mVrms(max)	2.5	Volume @max, w/ A/P Swept Bandpass Measurement (Line freq.+ harmonics) (BW=20 KHz)	Line level inputs must be terminated using 1KOHM
<b>Input Impedance</b>					
Line Input (L, R,LFE)	10K	ohms	n/a	Nominal	
<b>Filters</b>					
LP filter Variable	50-150	Hz	± 10		4th Order variable-24 db/Octave
Subsonic filter (HPF) 2nd Order	Fixed				
Friend circuit	Fixed				
LFE Low pass	200>LP<500	Hz		LFE input driven only	
<b>Limiter</b>					
THD at Max. Output Power	13	%	functional	Drive unit 6dB above the required level to obtain full power Approximately 208mV	Maximum THD as a result of limiting.
<b>Features</b>					
Volume pot Taper (lin/log)	LOG	--	functional		A Taper
Phase switch	0-180	deg	functional		
LP Filter defeat switch	YES		functional		Disables LP filter, intended for LFE
LED indicator	YES		functional		Bicolor LED located in top of the cabinet, RED-Standby, GRN-Active
<b>Input Configuration</b>					
Line In (L,R) & LFE	YES	--	functional		Dual RCA jack, for LFE use either L or R inputs
<b>Signal Sensing (ATO)</b>					
Auto-Turn-On (yes/no)	YES		functional		
ATO Input test frequency	50	Hz	functional		
ATO Level LFE Input	2	mV	functional		Maximum acceptable level.
ATO Turn-on time	5	ms	functional	Amp connected and AC on, then input signal applied	
Auto Mute/ Turn-OFF Time	5-15	minutes	5-15	T before muting, after signal is removed	Auto turn off time (T) must be 5 > T < 15 Minutes
Power on Delay time	3	sec.	4	After AC Power is applied	

Parameter	Specification	Unit	QA Test Limits	Conditions	Notes
<b>Transients/Pops</b>					
ATO Transient	0.5	V-peak	0.5V	@ Speaker Output	Amplifier activated by signal presence at the Line input
Turn-on Transient	0.5	V-peak	0.8V	@ Speaker Output	AC Line cycled from OFF to ON
Turn-off Transient	0.5	V-peak	0.8V	@ Speaker Output	AC Line cycled from ON to OFF
<b>Efficiency</b>					
Efficiency	61	%	60	Test conducted at rated power 250W	Nominal Line voltage
Efficiency at 1/8 of rated power	45	%	42	Test conducted at 31.25 WRMS	Nominal Line voltage-Rated impedance 4 Ohms
Off state input power	12	Watts	14		Nominal Line voltage RED LED
Stand-by Input Power	18	Watts	18	@ nom. line voltage	Maximum allowable input power under nominal Input voltage and frequency, HOT or COLD operation. LED GREEN no signal applied
Power Cons. @ rated power	367	Watts	375	@ nom. line voltage	225 Watts @ 4 Ohms nominal line voltage
<b>Protections</b>					
Short Circuit Protection	YES		functional	Direct short at output	Amplifier should resume operation after short circuit condition removal
Thermal Protection	YES		functional	@ 1/8 max unclipped Power at 1.06 times the input voltage	Temperature rise in accessible metal parts should not exceed 35K rise for domestic version or 30K rise for European versions (refer to requirements sheet).
DC Offset Protection	YES		-	DC present at Speaker Out leads	Design must insure no Offset at the speaker output under any operating condition including abnormal operation
<b>Line Fuse Rating</b>					
USA-Domestic	3.15	Amps	3.15	Type-T or Slo Blo-250 V	Internal fuse with UL/SEMKO rated holder
EU	2	Amps	2	Type-T or Slo Blo-250 V, Low Breaking capacity	Internal fuse with UL/SEMKO rated holder
<b>Other Parameters/Notes:</b>					
1. Limiter circuit response must be clean sounding with no apparent pops, noises, or pumping.					
2. Plate dimensions not to exceed 11.81"H x 7.87"W and the plate must be airtight with no possibility of air leaks (plastic cover required).					
3. Volume control should be at the input buffer stage in order to lessen the possibility of clipping the input section with highly dynamic audio material.					
4. ALL SPECS SHOULD BE MEASURED AT NOMINAL LINE VOLTAGE.					

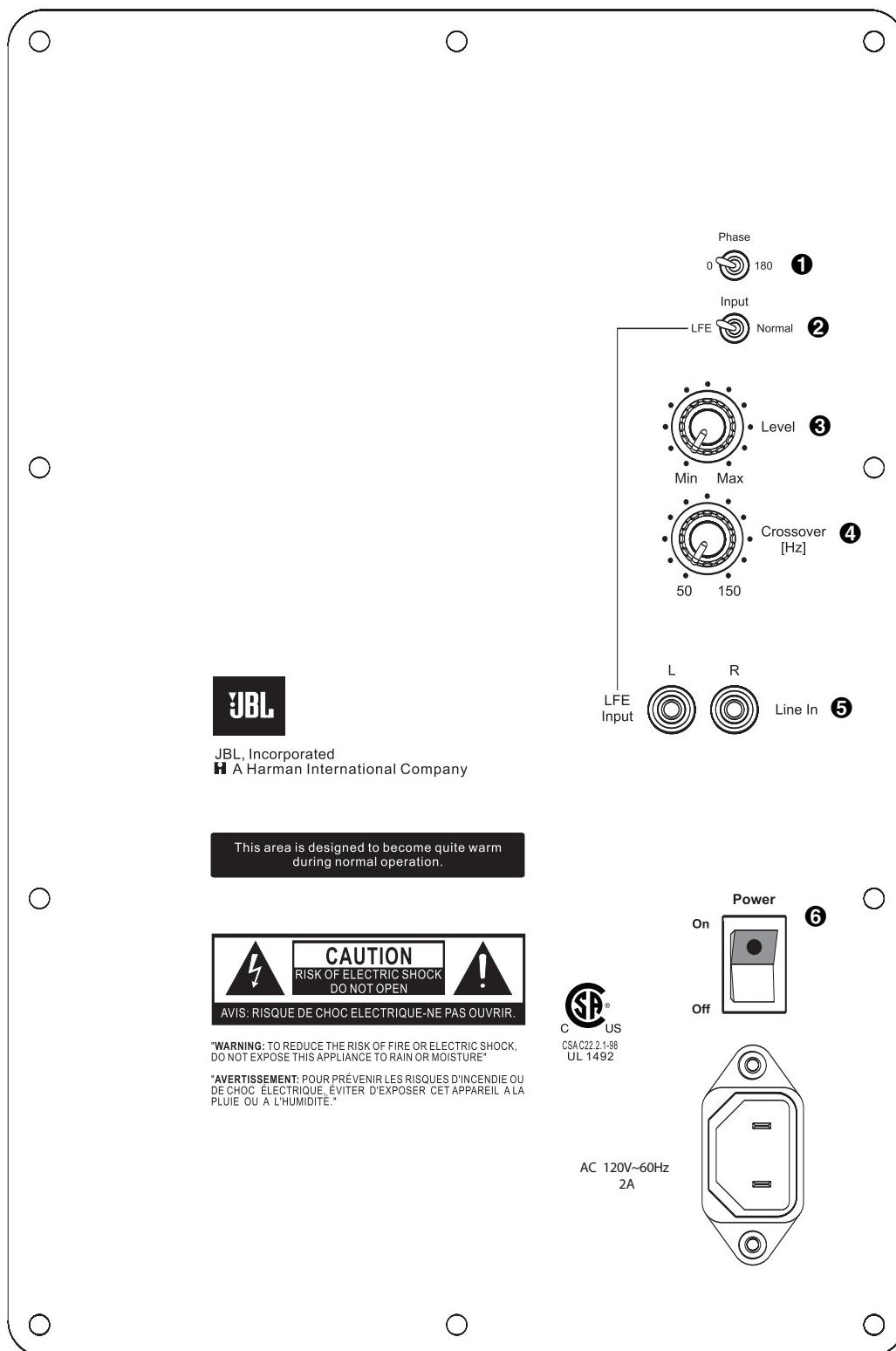
# ES150P PACKAGING



ITEM	PART NUMBER	DESCRIPTION	QTY
1		Serial Number Label	1
2	ES150PBE		
	ES150PBK		
	ES150PCH		
	ES150PSIG		
3		Label	1
4	431-000-06198-E	Top Foam	1
5	431-000-06199-E	Bottom Foam	1
6		Desiccant	1
7	165-045801100-E	15' RCA cable	1
8	Visit <a href="http://www.jbl.com">www.jbl.com</a>	Owner's Manual	1
9	405-000-05181-E	Warranty card	1
10	400-000-07835-E 400-000-07831-E	Outer Carton, ES150PBE Outer Carton, ES150PBK	1 1
	400-000-07830-E	Outer Carton, ES150PCH	1
	400-000-07834-E	Outer Carton, ES150PSIG	1
11		Label	1
12		Carton, grille	1
13	244-100-05276-0BAE	Front Grille	1
14		Packing, grille	1

## CONTROLS AND CONNECTIONS

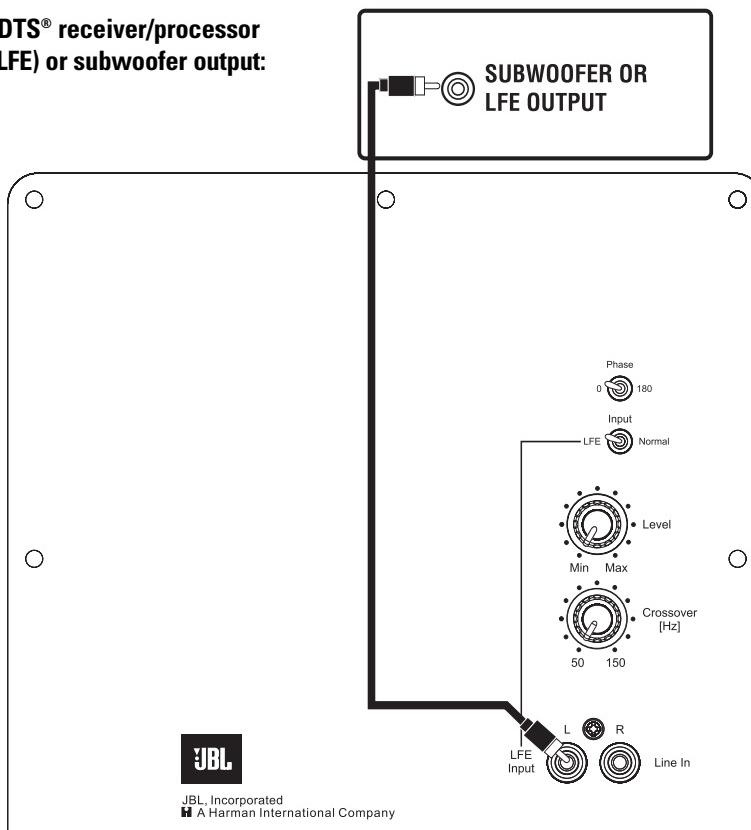
### Rear Panel



## SYSTEM CONNECTIONS

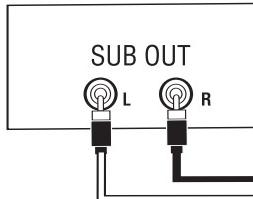
If you have a Dolby® Digital or DTS® receiver/processor with a low-frequency-effects (LFE) or subwoofer output:

Set LFE/Normal switch to "LFE."



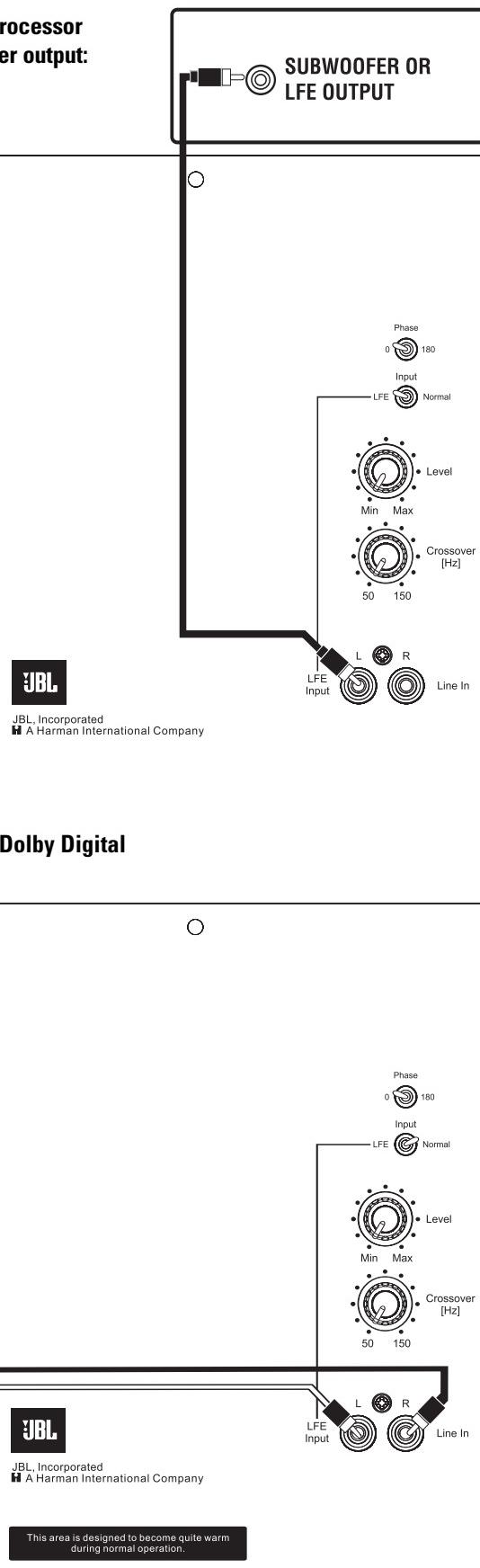
If your receiver/processor does not contain a Dolby Digital or DTS processor, but has subwoofer outputs:

RECEIVER/PROCESSOR



Set line-level/LFE switch to "Normal."

NOTE: If your receiver/processor has only one sub out, you may use either the L or R input.



## OPERATION

### Power On

Plug your subwoofer's AC cord into a wall outlet. Do not use the outlets on the back of the receiver.

Initially set the Subwoofer-Level Control **③** to the "min" position.

Turn on your sub by pressing the Power Switch **⑥** on the rear panel.

Turn on your entire audio system and start a CD or movie soundtrack at a moderate level.

### Auto On/Standby

With the Power Switch **⑥** in the ON position, the Status LED on the top will remain lit in red or green to indicate the On/Standby mode of the subwoofer.

RED = STANDBY (No signal detected, Amp Off)

GREEN = ON (Signal detected, Amp On)

The subwoofer will automatically enter the Standby mode after approximately 10 minutes when no signal is detected from your system. The subwoofer will then power ON instantly when a signal is detected. During periods of normal use, the Power Switch **⑥** can be left on. You may turn off the Power Switch **⑥** for extended periods of nonoperation, e.g., when you are away on vacation.

### Adjust Gain

Turn your Subwoofer-Level Control **③** up to the halfway position. If no sound emanates from the subwoofer, check the AC-line cord and input cables. Are the connectors on the cables making proper contact? Is the AC plug connected to a "live" receptacle? Has the Power Switch **⑥** been pressed to the "On" position? Once you have confirmed that the subwoofer is active, proceed by playing a CD, record or cassette. Use a selection that has ample bass information.

Set the overall volume control of the preamplifier or stereo to a comfortable level. Adjust the Subwoofer-Level Control **③** until you obtain a pleasing blend of bass. Bass response should not overpower the room but rather be adjusted so there is a harmonious blend across the entire musical range. Many users have a tendency to set the subwoofer volume too loud, adhering to the belief that a subwoofer is there to produce lots of bass. This is not entirely true. A subwoofer is there to enhance bass, extending the response of the entire system so the bass can be felt as well as heard. However, overall balance must be maintained or the music will not sound natural. An experienced listener will set the volume of the subwoofer so its impact on bass response is always there but never obtrusive.

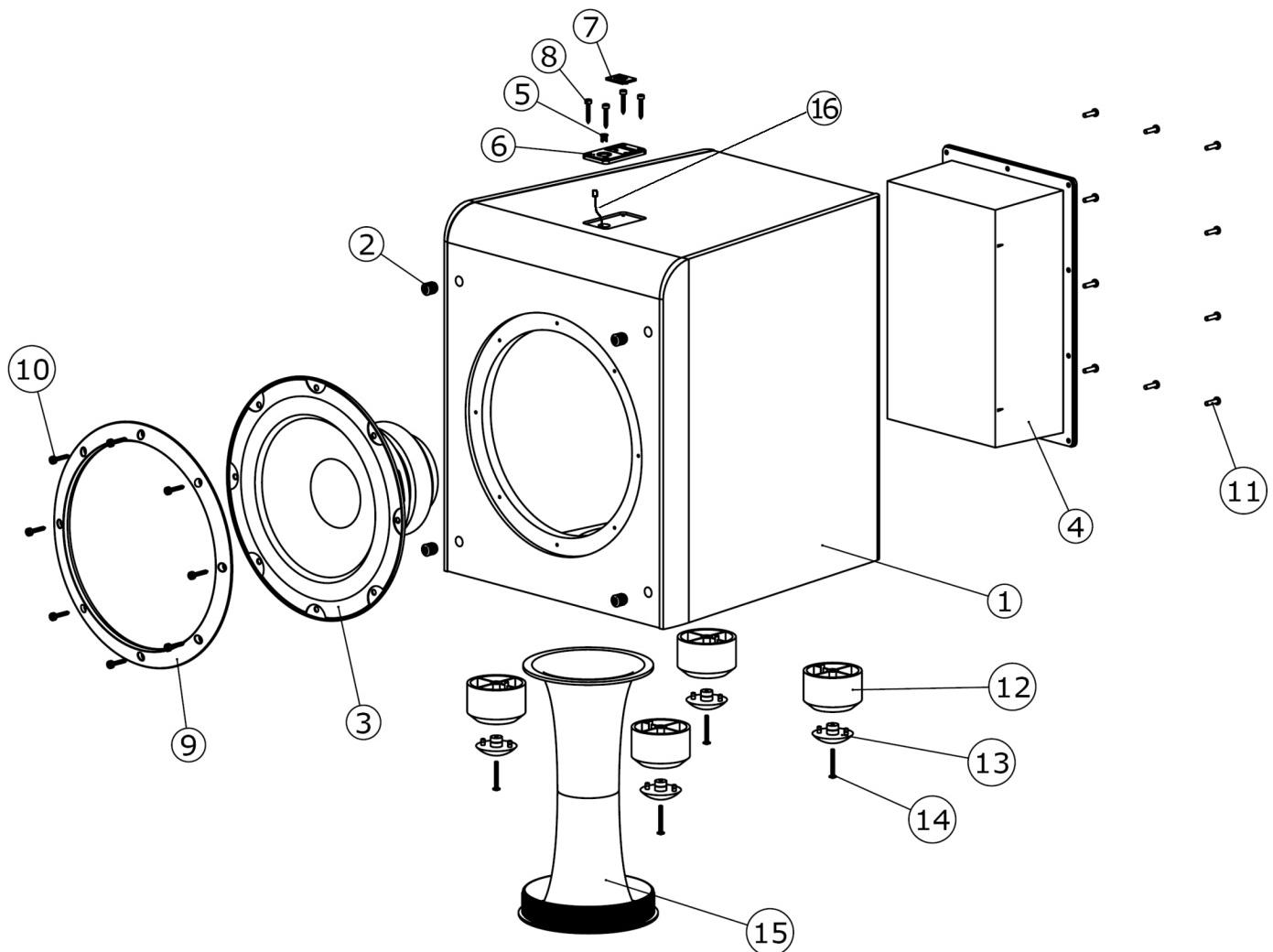
### Phase Control

The Phase Switch **①** determines whether the subwoofer speaker's pistonlike action moves in and out with the main speakers, 0°, or opposite the main speakers, 180°. Proper phase adjustment depends on several variables such as room size, subwoofer placement and listener position. Adjust the phase switch to maximize bass output at the listening position.

### Crossover Adjustment

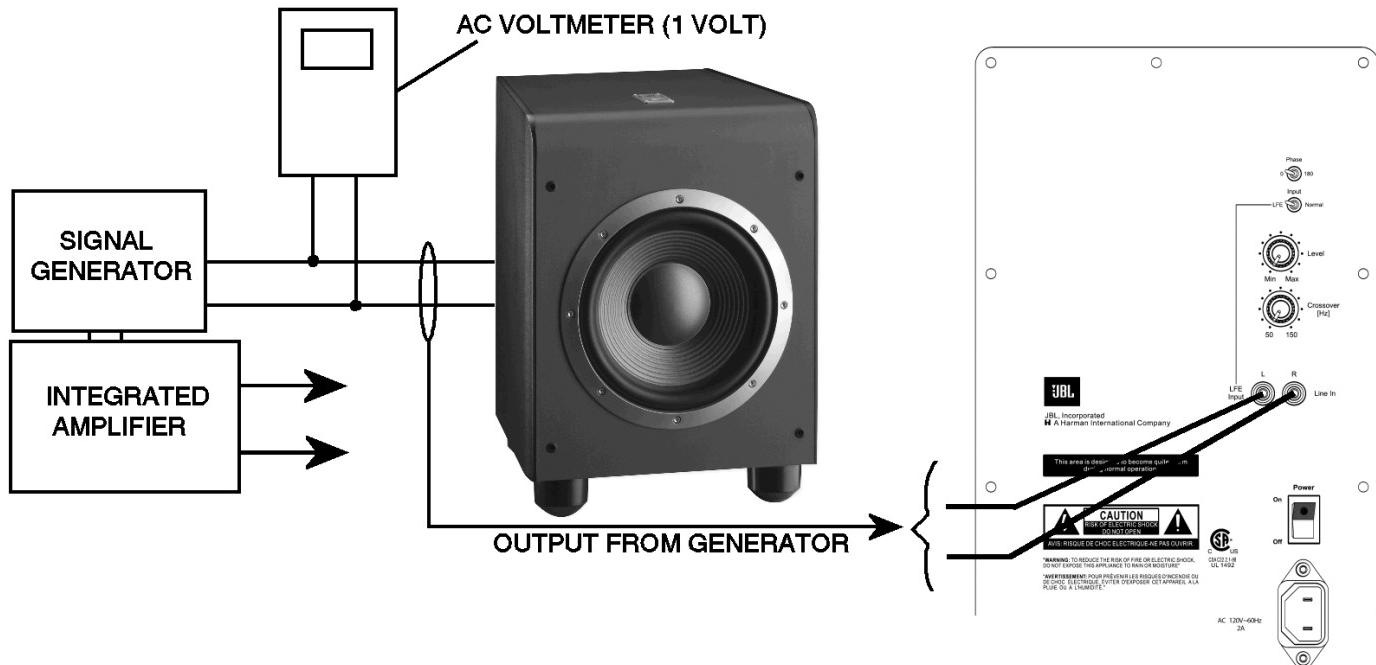
The Crossover Adjustment Control **④** determines the highest frequency at which the subwoofer reproduces sounds. If your main speakers can comfortably reproduce some low-frequency sounds, set this control to a lower frequency setting, between 50Hz and 100Hz. This will concentrate the subwoofer's efforts on the ultradeep bass sounds required by today's films and music. If you are using smaller bookshelf speakers that do not extend to the lower bass frequencies, set the Crossover Adjustment control to a higher setting, between 120Hz and 150Hz.

**NOTE:** This control will have no effect if the LFE/Normal Selector **②** is set to LFE. If you have a Dolby Digital or DTS processor/receiver, the Low-Pass Frequency is set by the processor/receiver. Consult your owner's manual to learn how to view or change this setting.



ITEM	PART NUMBER	DESCRIPTION	QTY
1	Not for Sale	ES150PBE Cabinet ES150PBK Cabinet ES150PCH Cabinet ES150PSIG Cabinet	1 1 1 1
2	327-010-00622-E	Grille Cup	4
3	25PR12FZL-DW04-E	10" woofer	1
4	Not for Sale	ES150P Amplifier	1
5	361-NYL-05101-0BAE	Retainer for LED	1
6	315-HPS-05097-0AAE	Plastic plate, logo base	1
7	316-HPS-05236-0AAE	JBL Logo	1
8	352-KM03520D1148-E	Screw, logo plate	4
9	213-100-05156-0AAE	Trim Ring 10"	1
10	352-KM04020D1149-E	Screw, trim ring	8
11	352-AM04020D880-E	Screw, Amplifier	10
12	321-ABS-00008-E	Foot, main body, plastic	4
13	321-RUB-00009-E	Foot, rubber cover	4
14	352-HM04030D500-E	Screw, Feet	4
15	249-HPS-05178-0BAE	Plastic port tube	1
16	162-a055d002-e	LED Harness	1

# ES150P Test Set Up and Procedure



## Equipment needed:

- Function/signal generator/sweep generator
- Integrated Amplifier
- Multimeter
- Speaker cables

## General Unit Function (UUT = Unit Under Test)

- 1) From the signal generator, connect line level (RCA) cables to the Subwoofer Line Level Input jacks L/R on the UUT. Use a Y-cable from a mono source if necessary to connect to both inputs.
- 2) Turn the CROSSOVER control to maximum (150).
- 3) Turn the LEVEL control on the UUT to completely counterclockwise (MIN).
- 4) LFE/NORMAL switch should be in NORMAL position.
- 5) PHASE switch position does not matter.
- 6) Turn on generator; adjust to **75mV, 50 Hz**.
- 7) Plug in UUT; turn the power switch ON. LED should switch from Red to Green.
- 8) Turn LEVEL control full clockwise (MAX); immediate and vigorous bass response should be heard and felt from port tube opening on the bottom.
- 9) Turn off generator, turn LEVEL control full counterclockwise (MIN), and disconnect RCA cable.

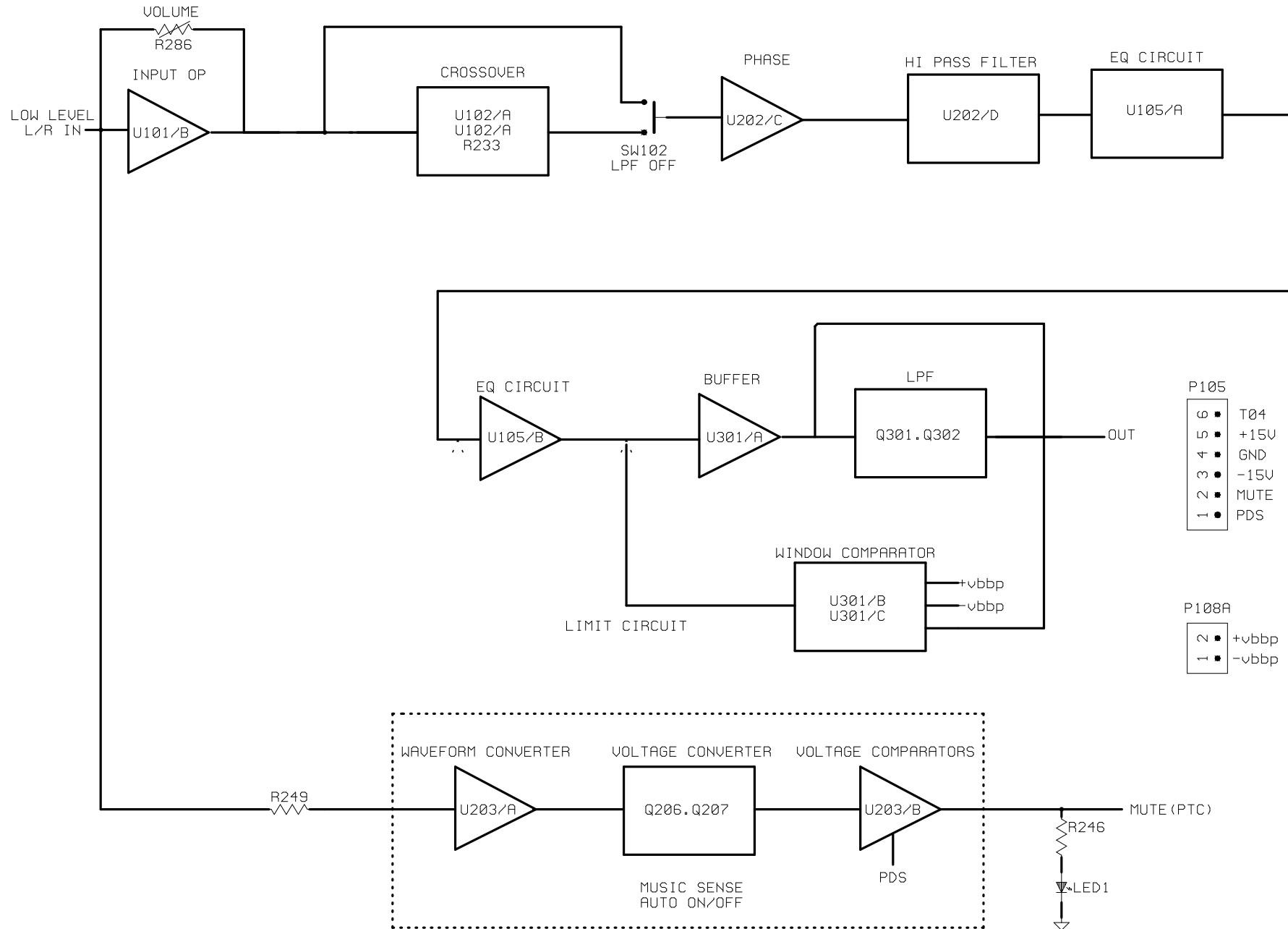
## Sweep Function

- 1) Follow steps 1-8 above, using a sweep generator as a signal source.
- 2) Sweep generator from 20Hz to 300Hz. Listen to the cabinet and drivers for any rattles, clicks, buzzes or any other noises. If any unusual noises are heard, remove woofer and test.

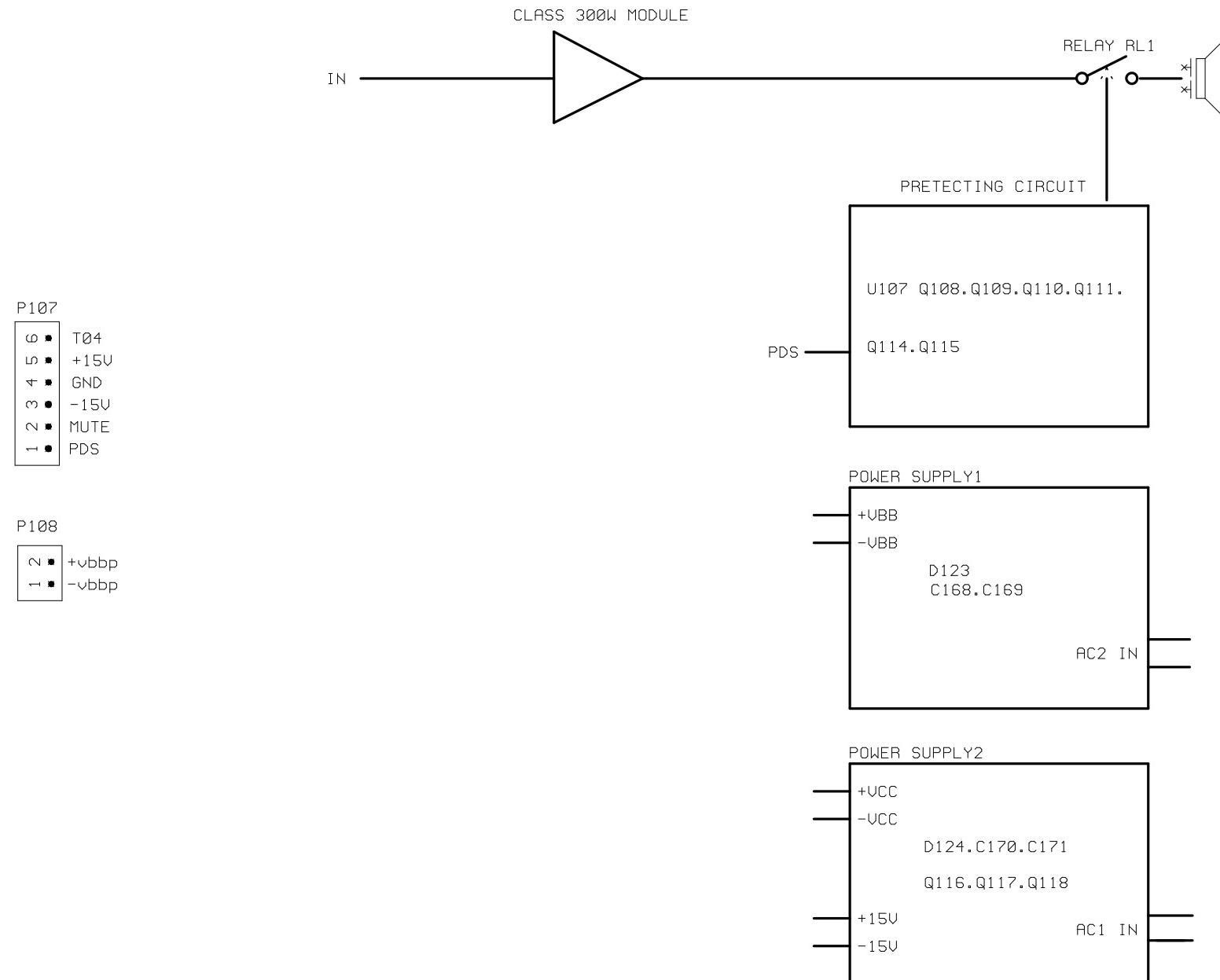
## Driver Function

- 1) Remove woofer from cabinet; detach + and - wire clips.
- 2) Check DC resistance of woofer; it should be **3.4 ohms ±10%**
- 3) Connect a pair of speaker cables to driver terminals. Cables should be connected to an integrated amplifier fed by a signal generator. Turn on generator and adjust so that speaker level output is **5.0V**.
- 4) Sweep generator from 20Hz to 1kHz. Listen to driver for any rubbing, buzzing, or other unusual noises.

## ES150P

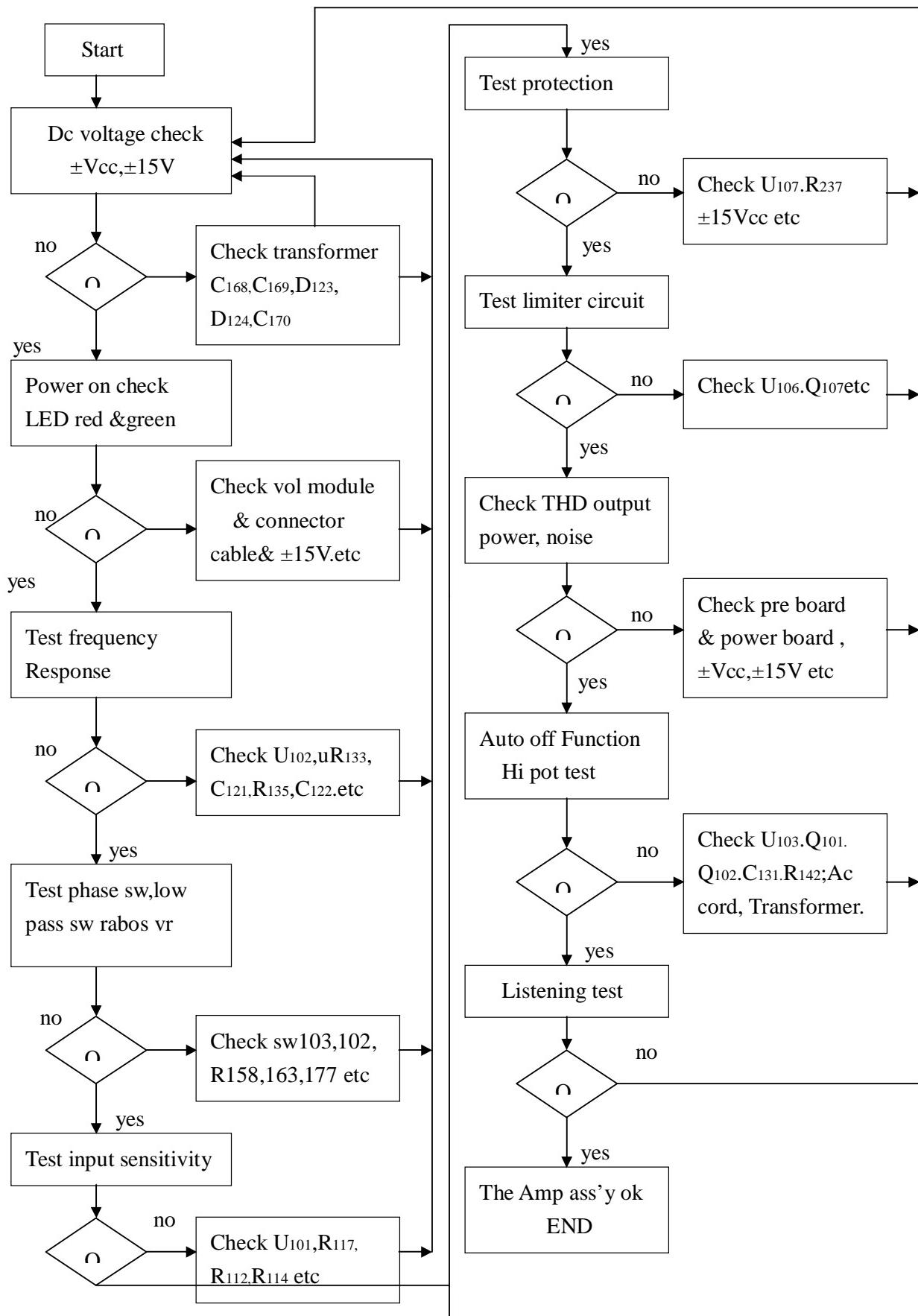


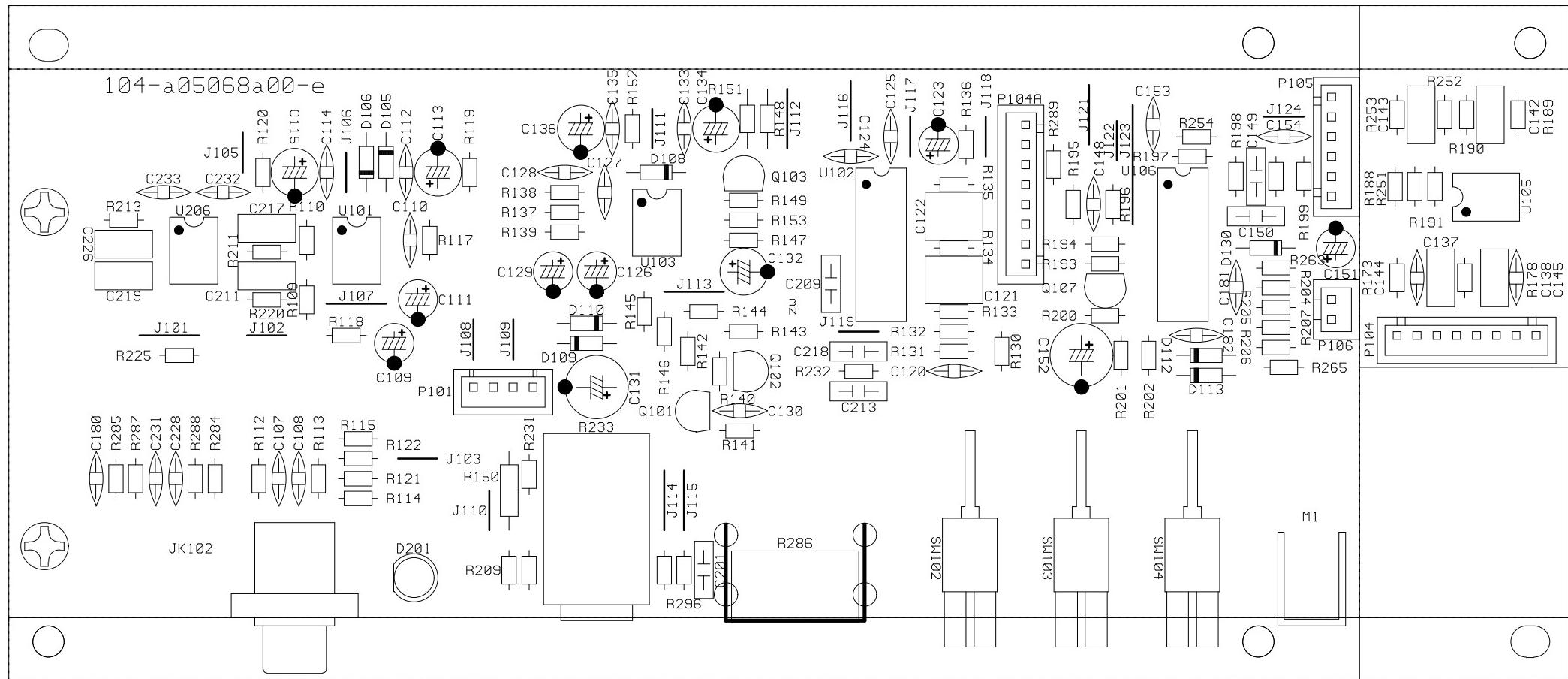
ES150P BLOCK DIAGRAM(PRE &amp; LIMIT)

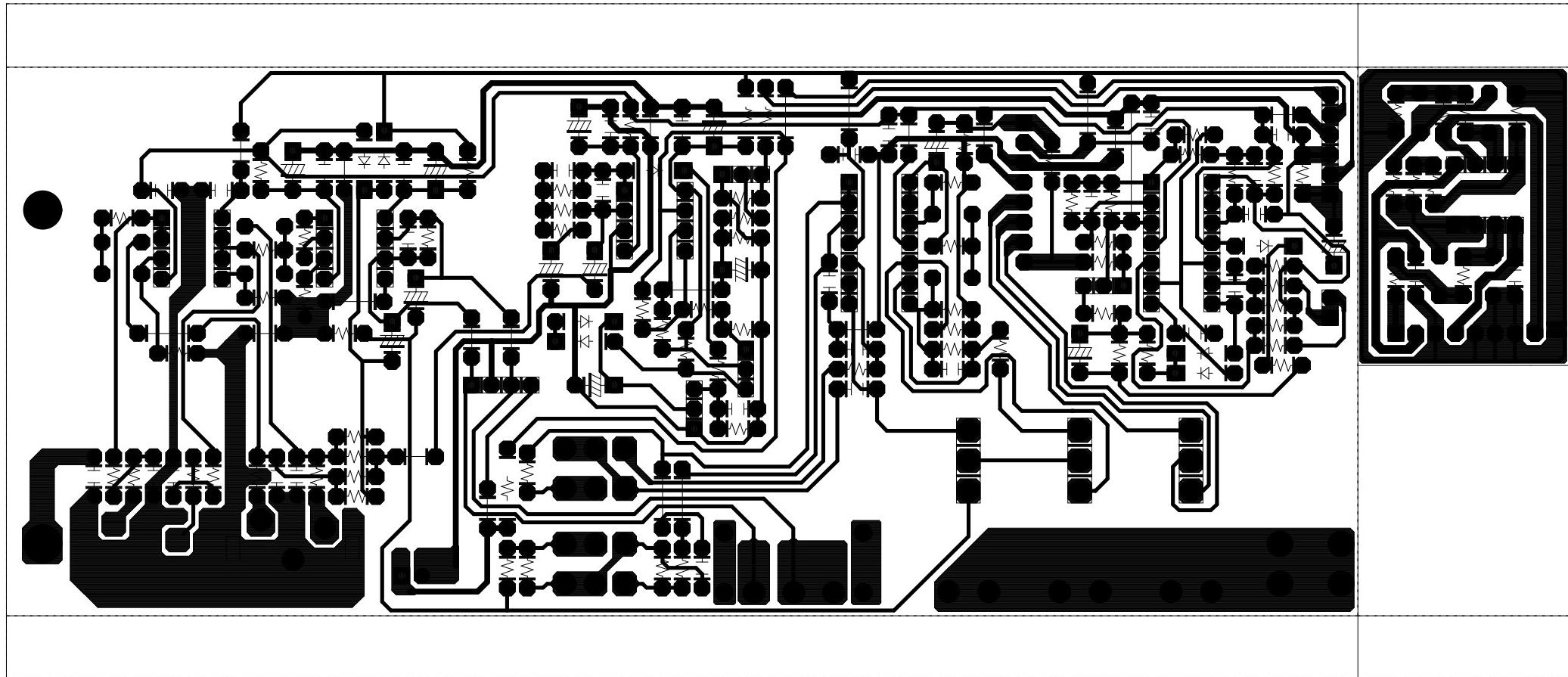


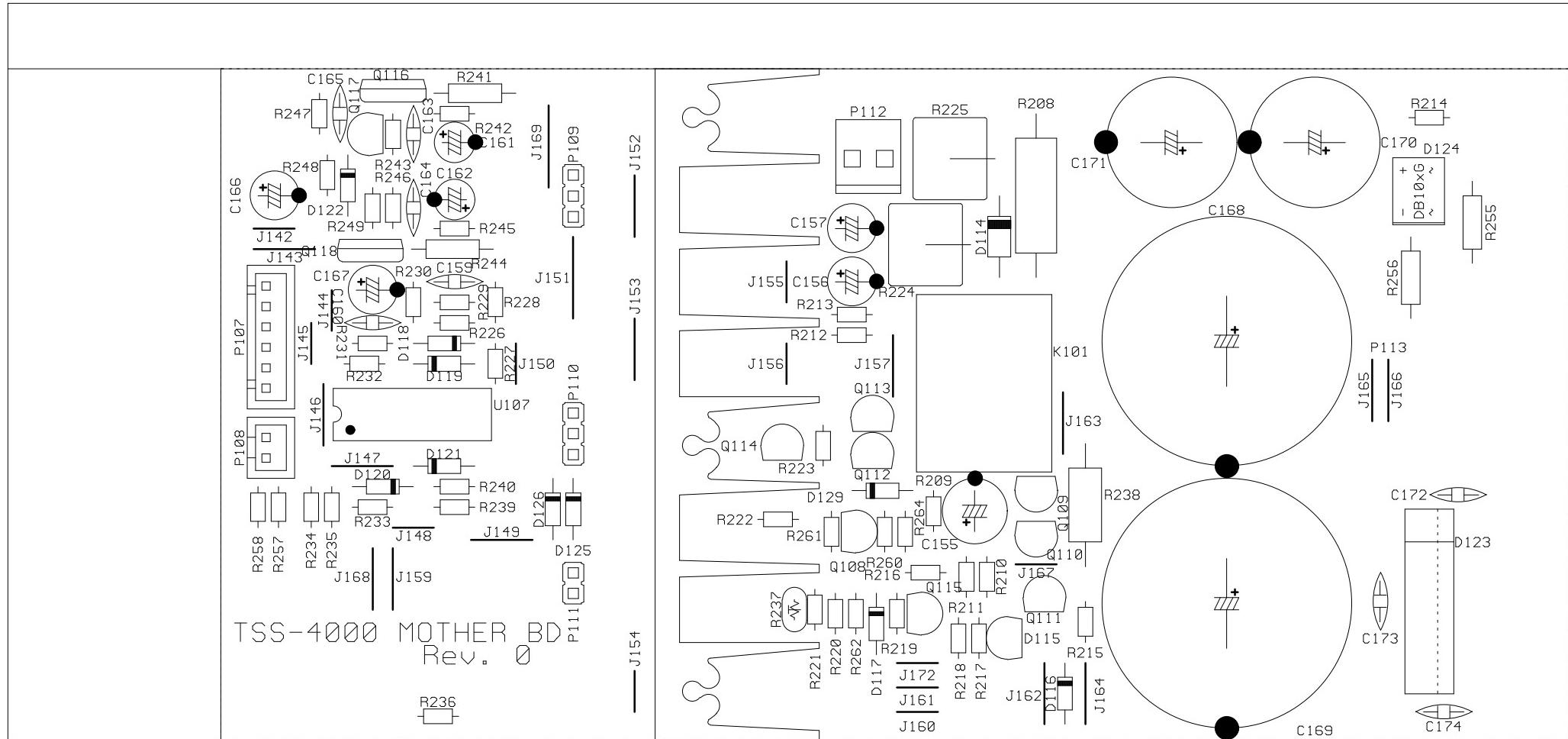
ES150P BLOCK DIAGRAM(POWER AMPLIFIER,POWER SOURCE,PROTECT)

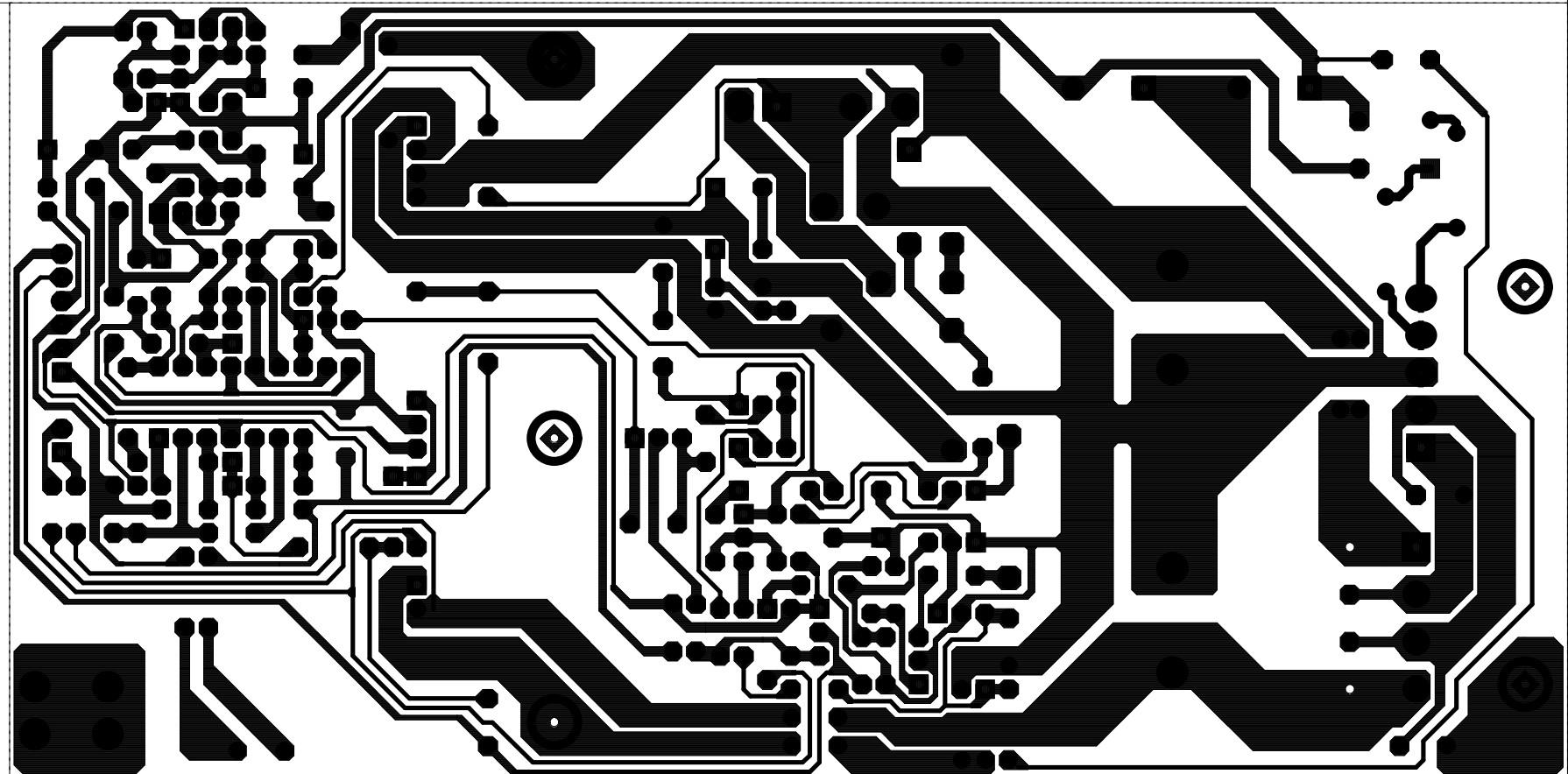
# ES150P Troubleshooting Testing Flow Chart

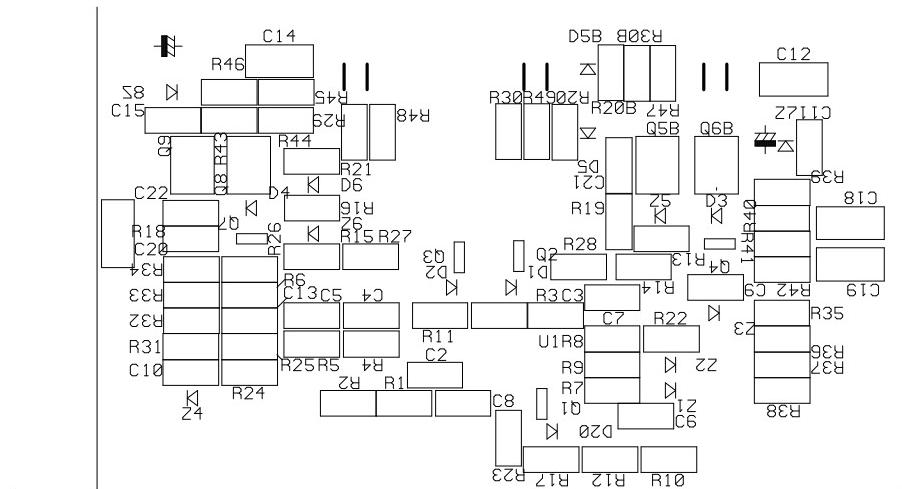
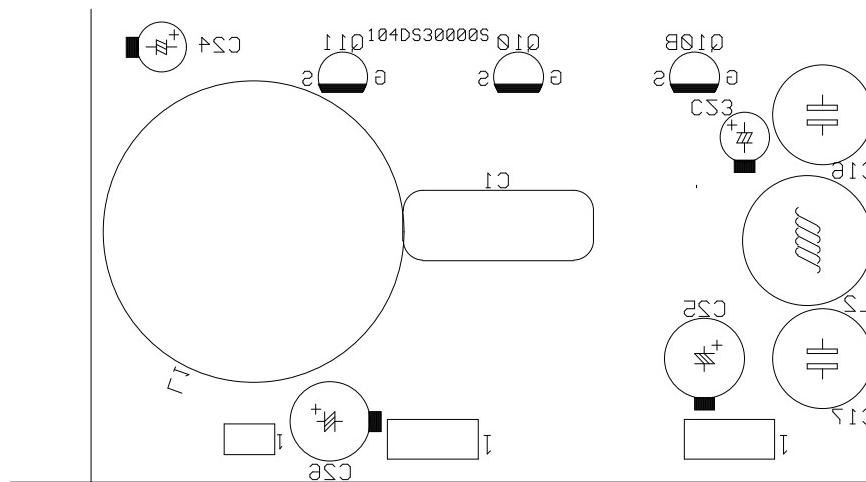
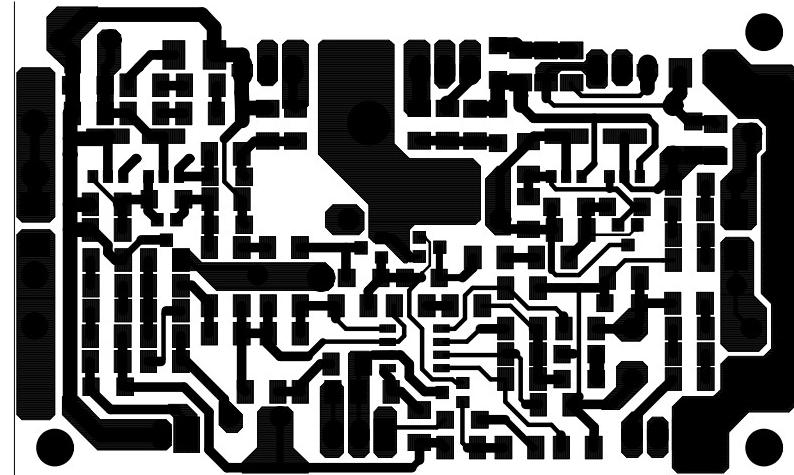
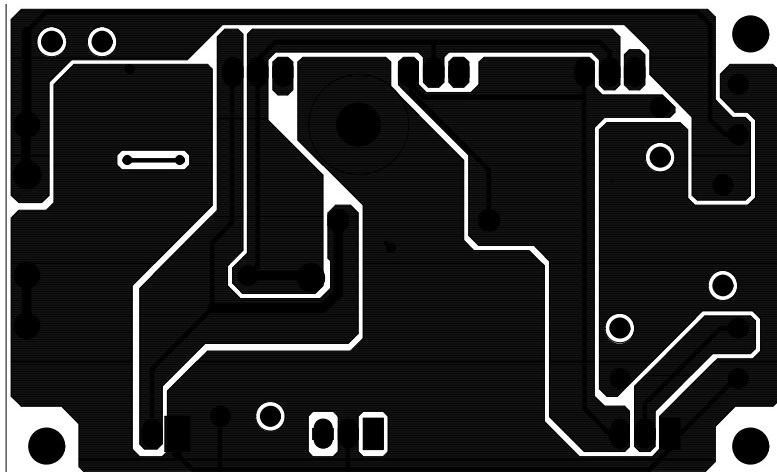












<b>ES150P (120v) Electrical Parts List</b>			
Part Number	Description	Qty	Reference Designator
<b>INPUT/PREAMP PCB &amp; DAUGHTER BOARD PCB</b>			
<i>Resistors</i>			
110-14392J26-E	CARBON RESISTOR 3.9K 1/4W ±5% CF (RoHS)	1	R150,
110-16000J26-e	CARBON RESISTOR 0Ω 1/6W ±5% CF (RoHS)	1	R191,
110-16101J26-E	CARBON RESISTOR 100Ω 1/6W ±5% CF (RoHS)	4	R112,R113,R151,R152,
110-16102J26-E	CARBON RESISTOR 1K 1/6W ±5% CF (RoHS)	1	R140,
110-16103J26-E	CARBON RESISTOR 10K 1/6W ±5% CF (RoHS)	7	R263,R118,R133,R136,R146,R149,R199,
110-16105J26-E	CARBON RESISTOR 1M 1/6W ±5% CF (RoHS)	1	R145,
110-16151J26-E	CARBON RESISTOR 150Ω 1/6W ±5% CF (RoHS)	1	R139,
110-16183J26-E	CARBON RESISTOR 18K 1/6W ±5% CF (RoHS)	1	R147,
110-16203J26-E	CARBON RESISTOR 20K 1/6W ±5% CF (RoHS)	1	R200,
110-16221J26-e	CARBON RESISTOR 220Ω 1/6W ±5% CF (RoHS)	2	R119,R120,
110-16223J26-E	CARBON RESISTOR 22K 1/6W ±5% CF (RoHS)	2	R141,R148,
110-16274J26-e	CARBON RESISTOR 270K 1/6W ±5% CF (RoHS)	1	R138,
110-16432J26-e	CARBON RESISTOR 4.3K 1/6W ±5% CF (RoHS)	1	R254,
110-16472J26-E	CARBON RESISTOR 4.7K 1/6W ±5% CF (RoHS)	1	R144,
110-16473J26-E	CARBON RESISTOR 47K 1/6W ±5% CF (RoHS)	1	R137,
110-16474J26-e	CARBON RESISTOR 470K 1/6W ±5% CF (RoHS)	1	R143,
110-164r7j26-e	CARBON RESISTOR 4.7Ω 1/6W ±5% CF (RoHS)	1	R153,
116-161002f26-e	METAL FILM RESISTOR 10K 1/6W ±1% MF (RoHS)	3	R130,R131,R132,
116-161212f26-e	METAL FILM RESISTOR 12.1K 1/6W 1% MF (RoHS)	1	R188,
116-161243F26-E	METAL FILM RESISTOR 1/6W 124K ±1% MF (RoHS)	1	R190,
116-161271F26-E	METAL FILM RESISTOR 1.27K 1/6W ±1% MF (RoHS)	1	R251,
116-161504f26-e	METAL FILM RESISTOR 1.5M 1/6W ±1% MF (RoHS)	1	R142,
116-162001f26-e	METAL FILM RESISTOR 2.00K 1/6W ±1% MF	1	R202,
116-162002f26-e	METAL FILM RESISTOR 20.0K 1/6W ±1% MF (RoHS)	1	R193,
116-162051f26-e	METAL FILM RESISTOR 2.05K 1/6W MF (RoHS)	1	R252,
116-162212f26-e	METAL FILM RESISTOR 22.1K 1/6W ±1% MF (RoHS)	6	R209,R231,R232,R296,R204,R206,
116-162553F26-E	METAL FILM RESISTOR 255K 1/6W±1% MF (RoHS)	1	R195,
116-162611f26-e	METAL FILM RESISTOR 1/6W 2.61K 1% (RoHS)	1	R253,
116-162803f26-e	METAL FILM RESISTOR 280K 1/6W±1% MF (RoHS)	1	R201,
116-163011f26-e	METAL FILM RESISTOR 3.01K 1/6W±1% MF (RoHS)	1	R194,
116-164421f26-e	METAL FILM RESISTOR 4.42K 1/6W ±1% MF (RoHS)	2	R205,R207,
116-164751f26-e	METAL FILM RESISTOR 4.75K 1/6W MF (RoHS)	3	R109,R110,R134,
116-164752f26-e	METAL FILM RESISTOR 47.5K 1/6W ±1% MF (RoHS)	2	R121,R122,
116-164871F26-E	METAL FILM RESISTOR 4.87K 1/6W ±1% MF (RoHS)	1	R189,
116-164991f26-e	METAL FILM RESISTOR 4.99K 1/6W ±1% MF (RoHS)	1	R265,
116-166491f26-e	METAL FILM RESISTOR 6.49K 1/6W ±1% MF (RoHS)	2	R114,R115,
116-168252F26-E	METAL FILM RESISTOR 82.5k 1/6w ±1% MF (RoHS)	1	R135,
116-169091f26-e	METAL FILM RESISTOR 9.09K 1/6W±1% MF (RoHS)	4	R197,R198,R173,R178,
115-h103a101-e	VARIABLE RESISTOR A10K (RoHS) LEVEL	1	R286
115-h503b405-e	VARIABLE RESISTOR B50K (RoHS) CROSSOVER	1	R233
<i>Capacitors</i>			
129-a222j633-e	METALIZED CAP. 0.0022u 63V ±5% MSC (RoHS)	2	C181,C182,
129-a273j633-e	METALIZED CAP 0.027uF 63v ±5% MSC(RoHS)	2	C209,C218,
129-a274j633-e	METALIZED CAP 0.27uf 63V ±5% (RoHS)	2	C121,C122,
129-a473j633-e	METALIZED CAP 0.047U 63V ±5% MSC (RoHS)	1	C138,
129-a563j633-e	METALIZED CAP 0.056uF 63V ±5% MSC (RoHS)	3	C149,C137,C143,
129-a823j633-e	METALIZED CAP 0.082U 63V ±5% MSC (RoHS)	3	C201,C213,C142,
130-2b221k503-e	DISC CAPACITOR 220P 50V ±10% (RoHS)	2	C107,C108,
130-3f104z503-e	DISC CAPACITOR 0.1U 50V +80/-20% (RoHS)	13	C112,C114,C124,C125,C130,C133,C135, C144, C145,C153,C154,C232,C233,
130-3f473m503-e	DISC CAPACITOR 0.047U 50V ±20% (RoHS)	1	C180,
130-sl101k503-e	DISC CAPACITOR 100P 50V SL ±10% (RoHS)	1	C120,
130-sl330ja03-e	DISC CAPACITORS 33P 100V±5% (RoHS)	1	C148,
130-sl470k503-e	DISC CAPACITOR 47P 50V ±10% (RoHS)	1	C128,
135-3105m50-e	ELECTROLYTIC 1U 50V ±20% (RoHS)	1	C126,
135-3106m50-e	ELECTROLYTIC 10uF 50V ±20% (RoHS)	4	C109,C111,C123,C129,

Part Number	Description	Qty	Reference Designator
<b>INPUT/PREAMP PCB &amp; DAUGHTER BOARD PCB</b>			
135-3107m16-e	ELECTROLYTIC 100uF 16V ±20% (RoHS)	5	C113,C115,C132,C134,C136,
135-3107m25-e	ELECTROLYTIC 100U 25V ±20% (RoHS)	1	C152,
135-3226m50-e	ELECTROLYTIC 22U 50V ±20% (RoHS)	1	C151,
139-3227m16-e	LOW LEAKAGE EC 220uF 16V ±20% (RoHS)	1	C131,
129-a473j633-e	METALIZED CAP. 0.047U 63V ±5% MSC (RoHS)	1	C150
<i>Semiconductors</i>			
192-027c1815gr-e	transistor 2SC1815GR TOSHIBA(RoHS) NPN	3	Q101,Q102,Q103,
197-631n4148-e	DIODE 500mW 75V 1N4148 Panjit (RoHS)	7	D105,D106,D108,D109,D110,D112,D113,
199-55000395-e	ZENER DIODE 3.9V 1/2W 52mm (RoHS)	1	D130,
190-06m4558d-e	I.C. OPA 4558D (RoHS) DUAL OP-AMP	2	U101,U103
190-16tl072n-e	I.C. TL072N @6.5 (RoHS) DUAL OP-AMP	1	U105
190-16tl074cn-e	I.C. TL074CN ST (RoHS) QUAD OP-AMP	2	U102,U106
192-153j111-e	FET J111 FAIRCHILD TO-92 (RoHS)	1	Q107
<i>Miscellaneous</i>			
175-1c02v01-e	WIRE CONNECTOR&BASE 2PIN PITCH=2.5mm (RoHS)	1	P106
175-9f40hr2-e	WIRE CONNECTOR&BASE 40PIN PITCH=2.54mm HR2*40 (RoHS)	0.5	D201
180-T000TS81-E	TACT SWITCH T2 T8019L-SNQ-E-H+U PHASE, LFE/NORMAL	2	SW102,SW103
362-FE-00041-OLAE	PCB holder 11.75*8.5*12.5H(RoHS)	1	
162-10169003-e	WIRE ASS'Y 160mm AWG28 WHITE/BLK (RoHS)	1	P105
162-50122004-e	WIRE ASS'Y 120mm RED/WHT 2PIN (RoHS)	1	D201
174-0rcb202vag-e	RCA JACK RCA-209 WITH GOLD (RoHS) INPUT	1	JK102
<b>MAIN PCB</b>			
<i>Resistors</i>			
110-12621j15-e	CARBON RESISTOR 620Ω 1/2W ±5% 15mm (RoHS)	1	R238,
110-20152j20-e	CARBON RESISTOR 1.5K 2W ±5% CF 20mm KINK(RoHS)	1	R208,
113-50r10j10-e	CEMENT RESISTOR 0.1Ω 5W ±5% (RoHS)	2	R224,R225,
116-142003f26-e	METAL FILM RESISTOR 200K 1/4W ±1% MF (RoHS)	1	R209,
110-16102J26-E	carbon resistor 1K 1/6W ±5% CF (RoHS)	3	R210,R239,R264,
110-16103J26-E	carbon resistor 10K 1/6W ±5% CF (RoHS)	9	R216,R227,R229,R230,R231,R232,R233, R260, R261,
110-16153j26-e	carbon resistor 15K 1/6W ±5% CF (RoHS)	2	R247,R249,
110-16182j26-e	carbon resistor 1.8K 1/6W ±5% CF (RoHS)	1	R248,
110-16222J26-E	carbon resistor 2.2K 1/6W ±5% CF (RoHS)	2	R242,R245,
110-16223J26-E	carbon resistor 22K 1/6W ±5% CF (RoHS)	3	R218,R220,R223,
110-16274j26-e	carbon resistor 270K 1/6W ±5% CF (RoHS)	1	R240,
110-16333j26-e	carbon resistor 33K 1/6W ±5% CF (RoHS)	1	R211,
110-16391j26-e	carbon resistor 390Ω 1/6W CF (RoHS)	2	R243,R246,
110-16472J26-E	carbon resistor 4.7K 1/6W ±5% CF (RoHS)	4	R213,R217,R219,R222,
110-16473J26-E	carbon resistor 47K 1/6W ±5% CF (RoHS)	1	R221,
110-16683j26-e	carbon resistor 68K 1/6W ±5% CF (RoHS)	1	R212,
112-14101j26-e	fuseresistor 1/4W 100ohm 5% (RoHS)	2	R241,R244,
116-141r00j26x-e	metal film resistor 1.00Ω 1/4W±5% MO (fireproofing resistor )	2	R255,R256,
116-161002f26-e	metal film resistor 10K 1/6W ±1% MF (RoHS)	2	R234,R235,
116-161301f26-e	metal film resistor 1.30K 1/6W MF (RoHS)	3	R226,R228,R236,
116-161692f26-e	metal film resistor 16.9K 1/6W MF (RoHS)	1	R214,
116-162001f26-e	metal film resistor 2.00K 1/6W ±1% MF (RoHS)	1	R215,
116-162492f26-e	metal film resistor 24.9K 1/6W ±1% MF (RoHS)	2	R257,R258,
116-166813f26-e	metal film resistor 681K 1/6W ±1% MF (RoHS)	1	R262,
<i>Capacitors</i>			
135-4228m35-e	ELECTROLYTIC CAP. 2200uF 35V ±20%(RoHS)	2	C170,C171,
138-5478m80-e	LARGE ALUMINUM EC 4700uF 80V ±20%85C (RoHS)	2	C168,C169,
130-2b102k503-e	DISC capacitor 1000P 50V ±10% (RoHS)	1	C165,
130-3f104z503-e	DISC capacitor 0.1U 50V +80/-20% (RoHS)	2	C163,C164,
130-ch101j503-e	DISC capacitor 100P 50V ±5% (RoHS)	2	C159,C160,

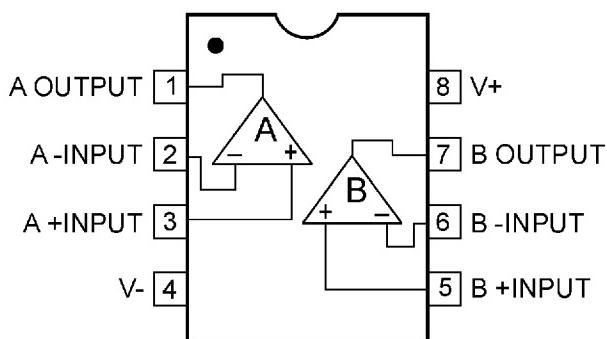
Part Number	Description	Qty	Reference Designator
<b>MAIN PCB</b>			
135-3107m16-e	electrolytic cap 100uF 16V ±20% (RoHS)	2	C166,C167,
135-3226m50-e	electrolytic cap 22U 50V ±20% (RoHS)	2	C161,C162,
135-3227m10-e	electrolytic cap 220U 10V ±20% (RoHS)	2	C156,C157,
139-3227m16-e	low leakage ec 220uF 16V±20% (RoHS)	1	C155,
140-RX473KB03-E	multi layer cap 47NF 200V X7R ±10% (RoHS)	2	C172,C173,
140-rx103ka03-e	multi layer cap 10nF 100V X7R 10%立式 (RoHS)	1	C174,
<b>Semiconductors</b>			
190-16lm324n-e	I.C. LM324N (RoHS) QUAD OP-AMP	1	U107,
192-991d669a-e	transistor HI-SINCERITY HSD669A (RoHS) NPN	1	Q116,
192-992b649t-e	transistor HSB649T (RoHS) PNP	1	Q118,
197-00DB103G-E	DIODE 1A 200V DF02MDB103G (RoHS) BRIDGE	1	D124,
197-00kbu1003-e	DIODE 10A 200V KBU1003(RoHS) BRIDGE	1	D123,
197-101n4002-e	DIODE1N4002TB (RoHS)	1	D114,
190-16l431clp1-e	IC TL431CLP (RoHS) PROGRAMMABLE VOLTAGE REFERENCE	1	D115
192-027c1815gr-e	transistor 2SC1815GR TOSHIBA(RoHS) NPN	4	Q110,Q112,Q114,Q117,
192-028a1015gr-e	transistor 2SA1015GR TOSHIBA(RoHS) PNP	3	Q111,Q113,Q115,
192-1572n5551-e	transistor FSC 2N5551 (RoHS) NPN	1	Q109,
192-1582n5401-e	transistor FSC 2N5401 AI-PNP 350V500mA TO-92 (RoHS)	1	Q108,
197-631n4148-e	dilide500mW 75V 1N4148 Panjit (RoHS)	7	D117,D118,D119,D120,D121,D126,D125,
199-65000563g-e	ZENER diode GDZJ5.6B 500mW 5.6V 2% (RoHS)	1	D116,
199-65001503g-e	ZENER diode GDZJJ15C500mW 15V 2%ROHM 52mm 1N5245B	1	D122,
199-65002003g-e	ZENER diode GDZJJ20D 500mW 20V 2% (RoHS)	1	D129,
<b>Miscellaneous</b>			
109-1tsc103j0-e	THERMISTOR TSC05103J (RoHS)	1	R237,
175-1c02v01-e	WIRE CONNECTOR&BASE 2PIN PITCH=2.5mm (RoHS)	1	P108,
175-1c06v01-e	WIRE CONNECTOR&BASE 6 PIN PITCH=2.5mm(RoHS)	1	P107,
175-1d02v01-e	WIRE CONNECTOR&BASE 2PIN PITCH=3.96mm(RoHS)	1	P112,
175-1d05v01-e	WIRE CONNECTOR&BASE 5PIN 3.96mm (RoHS)	1	P113,
362-FE-00041-0LAE	PCB SUPPORT 11.75*8.5*12.5H(RoHS)	1	
171-udhss124d-e	RELAY 5A 24V UDH-SS124D(RoHS)	1	K101,
<b>CLASS D PCB ASS'Y (RECOMMENDED REPLACE ENTIRE MODULE PART# 051-A05102C-E)</b>			
<b>Resistors</b>			
118-12061001f-e	SMD resistor 1K 1206 1% (RoHS)	1	R2,
118-12061002f-e	SMDresistor 10K 1206 1% (RoHS)	1	R25,
118-12061002j-e	SMDresistor 10.0K 1206 5% (RoHS)	5	R29,R30,R30B,R7,R9,
118-120610r0j-e	SMDresistor 10.0Ω 1206 5% (RoHS)	4	R20,R20B,R22,R23,
118-12061501f-e	SMDresistor 1.5K 1206 1% (RoHS)	12	R31,R32,R35,R36,R39,R40,R41,R42,R43, R44,R45,R46,
118-12062002f-e	SMDresistor 20K 1206 1% (RoHS)	1	R26,
118-12062201j-e	SMDresistor 2.20K 1206 5% (RoHS)	8	R13,R16,R33,R34,R37,R38,R14,R15,
118-12062204j-e	SMDresistor 2.20M 1206 5% (RoHS)	1	R4,
118-12062211f-e	SMDresistor 2.21K 1206 1% (RoHS)	1	R6,
118-12062550f-e	SMD resistor 1206 255Ω 1% (RoHS)	1	R24,
118-12062701j-e	SMDresistor 2.70K 1206 5% (RoHS)	1	R10,
118-12063300j-e	SMDresistor 330Ω 1206 5% (RoHS)	1	R21,
118-12063301j-e	SMDresistor 3.30K 1206 5% (RoHS)	2	R27,R28,
118-12063321f-e	SMDresistor 3.32K 1206 1% (RoHS)	1	R1,
118-12063922f-e	SMDresistor 1206 39.2K±1% (RoHS)	1	R3,
118-12064700j-e	SMDresistor 470Ω 1206 5% (RoHS)	2	R8,R11,
118-12064701j-e	SMDresistor 4.70K 1206 5% (RoHS)	1	R12,
118-12064751f-e	SMDresistor 4.75K 1206 1% (RoHS)	1	R5,
112-10180j00-e	FUSE RESISTOR FMF 1W 18Ω 5%(RoHS)	1	R47
<b>Capacitors</b>			
128-e106ma01-se	CROSSVER CAP. 10uF 100V 20% of shi xi (RoHS)	2	C16,C17,

Part Number	Description	Qty	Reference Designator
<b>CLASS D PCB ASS'Y (RECOMMENDED REPLACE ENTIRE MODULE PART# 051-A05102C-E)</b>			
130-sl681kb03-e	DISC CAPACITOR SL 680PF 200V (RoHS)	1	C21
132-104kb50-e	MYLAR CAPACITOR 0.1U ±10% 250V long LS-10.mm MD (RoHS)	1	C20,
141-D7104KA0-E	SMDcapacitor 0.1uF 100V 10%1210 X7R (RoHS)	2	C18,C19,
141-D7104KB5-E	SMDcapacitor 0.1uF 250V 10%1210 X7R (RoHS)	2	C12,C14,
141-c0101k50-e	SMDcapacitor 100pF 50V 10%1206 NP0 (RoHS)	1	C4,
141-c0220k50-e	SMDcapacitor 22pF 50V 10% 1206SMT NPO (RoHS)	1	C5,
141-c0561k50-e	SMDcapacitor 560pF 50V 10%1206 NPO (RoHS)	1	C6,
141-c5104m50-e	SMDcapacitor1206 Y5V 0.1uF50V ±20% (RoHS)	8	C2,C3,C7,C8,C9,C10,C11,C15,
141-c7103k50-e	SMD capacitor 10nF 50V 1%1206 X7R (RoHS)	1	C13,
132-105kb50-e	MYLAR CAPACITOR 1uF 250V ±10% long (RoHS)	1	C40,
<i>Semiconductors</i>			
192-232irf9640-e	FET IRF9640 IR P-CH TO220(RoHS)	2	Q10,Q10B,
192-233f640n-e	TRANSISTOR IRF640N INTERNATIONAL(RoHS)	1	Q11,
190-16tl072dts-e	SMD I.C. TL072CDT SGS THOMSON(RoHS) DUAL OP-AMP	1	IC1,
192-09124126qs-e	SMD transistor 2SC2412K-T146Q/RROHM (RoHS)	2	Q1,Q4,
192-09139066rs-e	SMD transistor 2SC3906K-T146R ROHM(RoHS)	2	Q2,Q8,
192-091sc4672-e	transistor 2SC4672(MPT3) ROHM(RoHS)	1	Q5B,
192-09210376qs-e	SMD transistor 2SA1037K-T146Q/RROHM (RoHS)	2	Q7,Q9,
192-09215146rs-e	SMD transistor 2SA1514K-T146R ROHM(RoHS)	1	Q3,
192-1582n5401-e	transistor FSC 2N5401 AI-PNP 350V500mA TO-92 (RoHS)	1	Q6B,
197-03rls4148s-e	*SMD DIODE RLS4148-TE11 ROHM(RoHS)	8	D1,D2,D3,D4,D5,D5B,D6,D20,
199-15000563s-e	SMD ZENER 5.6V 5% PHILIPSBZX84-C5V6 (RoHS)	2	Z1,Z2,
199-1500120s-e	SMD ZENER 12V 5% PHILIPSBZX84-C12 (RoHS)	4	Z3,Z4,Z5,Z6,
<i>Miscellaneous</i>			
175-9F02H02-E	WIRE CONNECTOR&BASE 2PIN PITCH=2.54mm(RoHS)	1	HDR3,
175-9F03H020-E	WIRE CONNECTOR&BASE 3PIN PITCH=2.54mm(RoHS)	2	HDR1,HDR2,
122-13151k0190-e	CHOKE SA-500-280(PT1601B*151MAA) (RoHS)	1	L1,
122-14300k4-e	Ferrite core LD1215*300KU±10% (RoHS)	1	L2,
<b>MISC./MECHANICAL &amp; AC INPUT PCB</b>			
128-C117JA01-E	electrolytic CAP 110uf 100V	1	On Woofer terminals
150-R0905505-E	POWER TRANSFORMER 115V/60Hz 300W(RoHS)	1	
152-u60201a06-e	LINE CORD 6FT UL 2PIN WITH PLASTIC BAG (RoHS)	1	
153-vpst101s2-e	AC OUTLET&SOCKET VDE 2PINS INLET SOCKET PRONIC	1	
154-k30005t0-e	FUSE 3A 250V 30mm UL/CSA(RoHS)	1	
155-630r345b-e	FUSE HOLDER UL/CSA ϕ6*30mm R3-45B (RoHS)	1	
162-10100023-e	WIRE UL/CSA 1617 #22 100mmBLK (RoHS)	1	
162-10151001-e	WIRE UL1617 150mm 22AWG BROWN6:6 (RoHS)	1	
162-5016d001-e	WIRE 24# 160mm BLK (RoHS)	1	
162-5020d006-e	WIRE UL2468 200mm 2.5mmpitchRED/WHT (RoHS)	1	
162-a055d002-e	WIRE ASS'Y 550mm UL2468 26AWG RED/WHTΦ5LED(RoHS)	1	
166-5070a4bd-e	SPKER WIRE 700mm #18 #205*0.5tBLK/#250*0.8t RED(RoHS)	1	
180-prf1003b-e	SWITCH ROCK RF-1003-BB210(RoHS) POWER	1	
193-0s4211-e	INSULATOR (INSULATION SPACER)42*11 (RoHS)	1	
193-201612tr-e	INSULATOR T0-220 16mm*12mm(RoHS)	3	
302-AL-05123-0BAE	REAR BOARD300*200*2.5 BLK ES150P/120V USE (RoHS)	1	
306-ABS-05081-0BAE	REAR HOUSMG 198*298*102mm WITH 8piece EVA (RoHS)	1	
311-ABS-00028-0BAE	KNOB 46077-W P.V.C.(RoHS) LEVEL, CROSSOVER	2	
323-AL-05000-0LAE	HEAT SINK (RoHS)	1	
325-FE-00400-0LAE	PCBFLOOR STAND 58*9*13.5T (RoHS)	1	
333-EVA-00188-0BAE	EVA GASKET 170x5x1t WITH GLUE (RoHS)	1	
333-EVA-00220-0BAE	EVA GASKET LONG 225*15*1t UL(RoHS)	1	
333-EVA-00866-0BAE	FIREPROOFING EVA 48*18*1.5T (RoHS)	1	
333-SPG-00860-0BAE	FIREPROOFING EVA 450*50*5T (RoHS)	1	
335-NYL-00002-0BAE	WIRE CLIP 4K-4 NO-BB(RoHS)	1	
336-RUB-05103-0BAE	RUB PAD 97*16*3.0T BLK (RoHS)	2	
350-EM04012D024-E	4 ♂ *12WOOD SCREW BLK (RoHS)	4	
351-AM03008A078-E	M3*8 MACHINE SCREW CROSS WITH NICKEL (RoHS)	4	

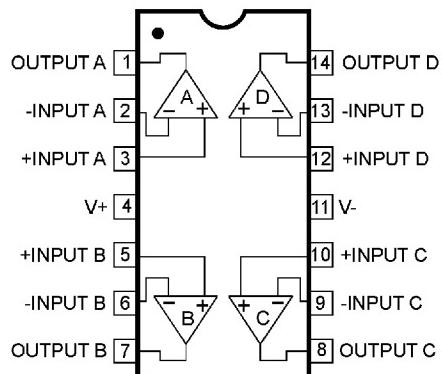
Part Number	Description	Qty	Reference Designator
<b>MISC./MECHANICAL &amp; AC INPUT PCB</b>			
351-AM03008A079-E	M3*8 MACHINE SCREWCROSS BLK (RoHS)	7	
351-AM03018A905-E	MACHINE SCREW M3.0*18 CROSS with nickel (RoHS)	2	
351-HM03006A1258-E	MACHINE SCREW M3*6mm CROSS with nickel (RoHS)	1	
351-HM04010A217-E	M4*10 MACHINE SCREWCROSS BLK(RoHS)	4	
352-AM03008D040-E	¢ 3*8 B TYPE PING SCREW CROSS BLK (RoHS)	2	
352-AM03008D041-E	¢ 3*8 B TYPE PING SCREWCROSS WITH NICKEL (RoHS)	2	
352-AM03010D065-E	¢ 3*10 P TYPE PING SCREWCROSS BLK (RoHS)	1	
352-BM03010D064-E	¢ 3*10 B TYPE PING SCREWCROSS BLK (RoHS)	2	
355-P07049-E	WASHER 7.2*12*0.5t COLOR (RoHS)	2	
361-FE-00002-0LAE	HOLDER 90*70*15mm (RoHS)	1	
361-FE-05016-0LAE	SECC HOLDER 36*12.5*8.5 (RoHS)	1	
362-FE-00013-0LAE	PCB HOLDER L TYPE t=1.6mmS.P.C.C 89*9*1.6T (RoHS)	1	

# Integrated Circuit Diagrams

**4558, TL072 DUAL OP-AMP  
IC1, U101,103,105**

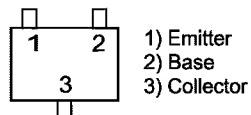


**OPAMP,  
QUAD 14P DIL TL074 LM324  
U102,106,107**



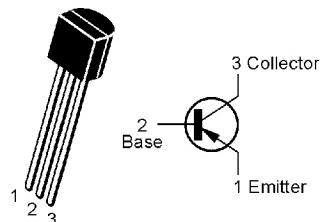
\* MMBT3906LT1 SOT23  
2SC4672K(MPT3)  
2Sa1037K-T146Q/r  
2SC2412K 2SA1514K

**Q1,2,3,4,5B,7,8,9**

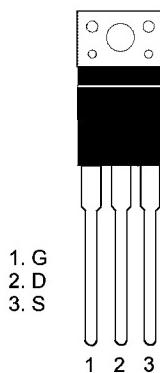


\* PREFIX MAY BE "FMMT"

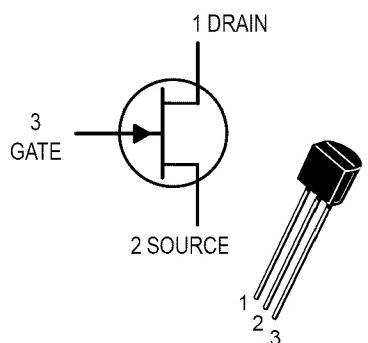
**2N5401  
Q6B, 108**



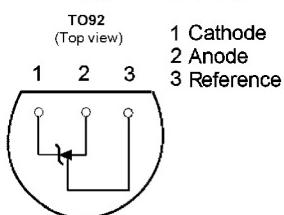
**MOSFET IRF640, 9640  
Q10,10B,11**



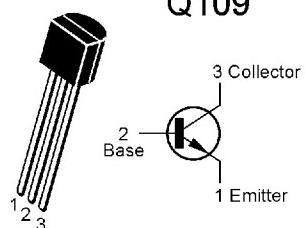
**FET J111  
Q107**



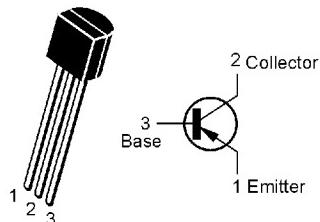
**TL431 D115**



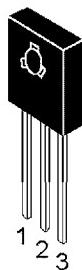
**2N5551  
Q109**



**2SA1015  
Q111,113,115**



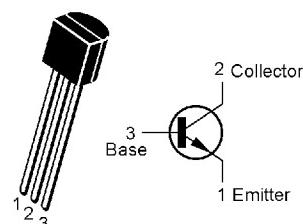
**HSD669A, HSB649A  
Q116,118**

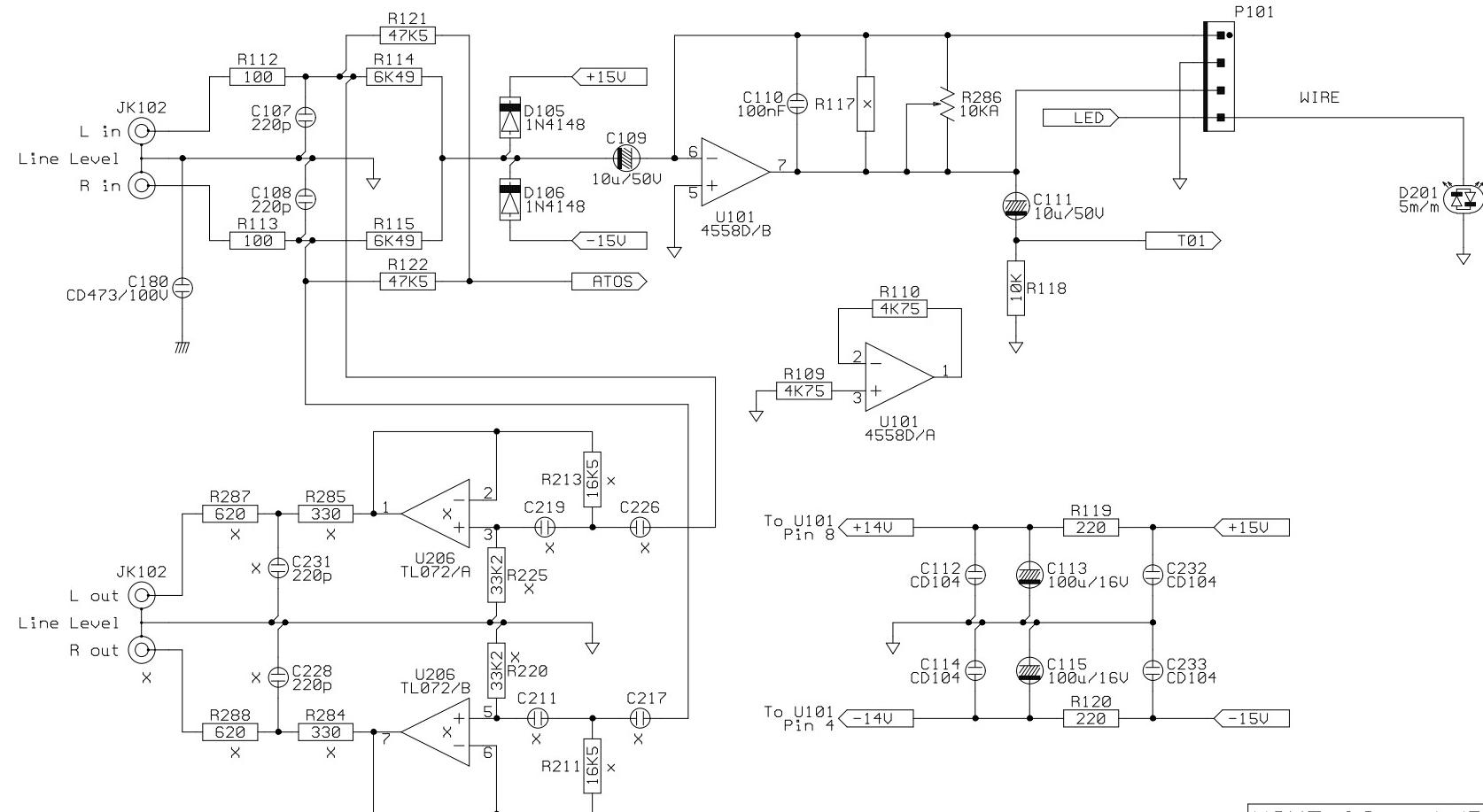


**1. Emitter  
2. Collector  
3. Base**

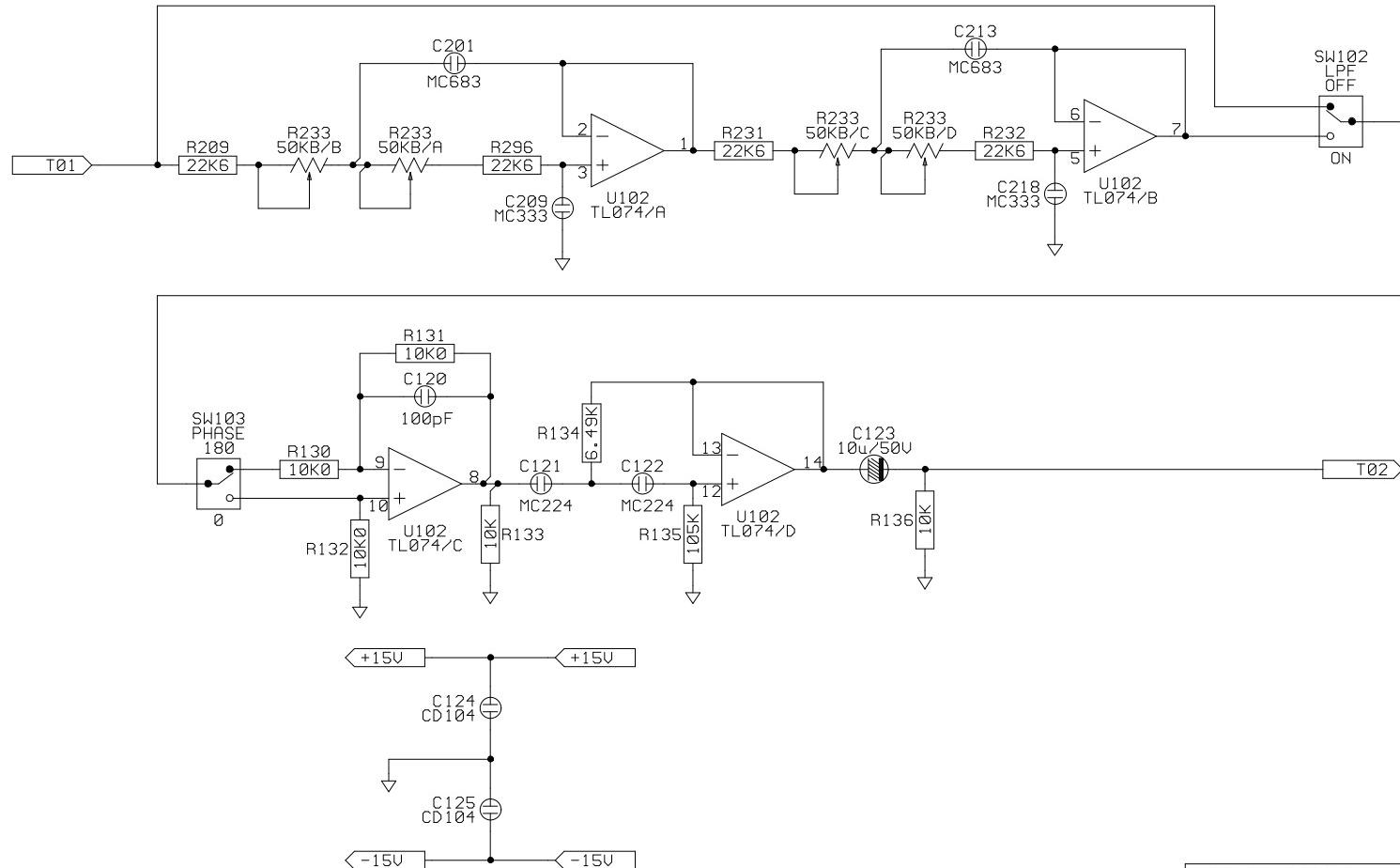
**2SC1815**

**Q101,102,103,110,112,114,117**

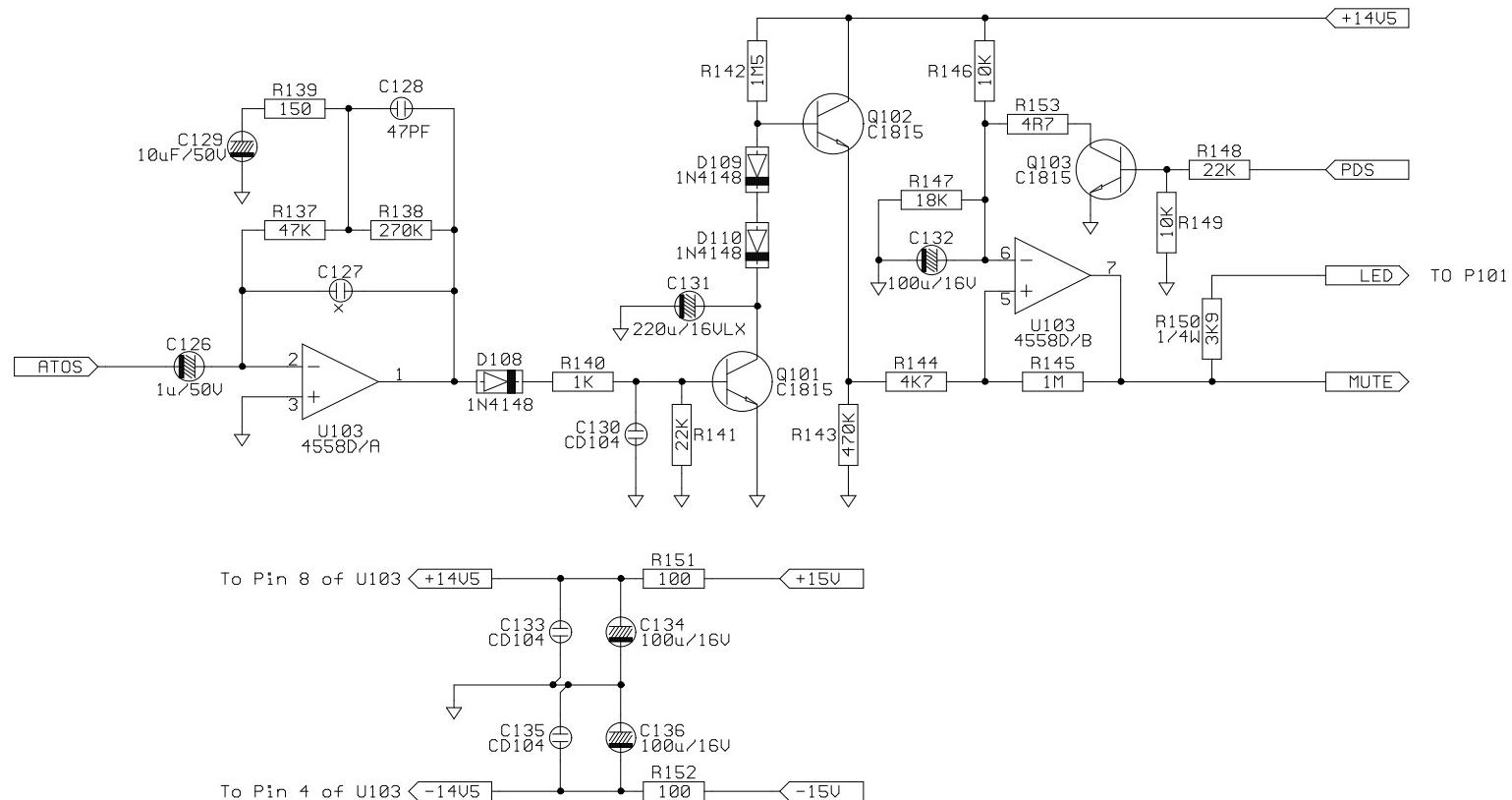




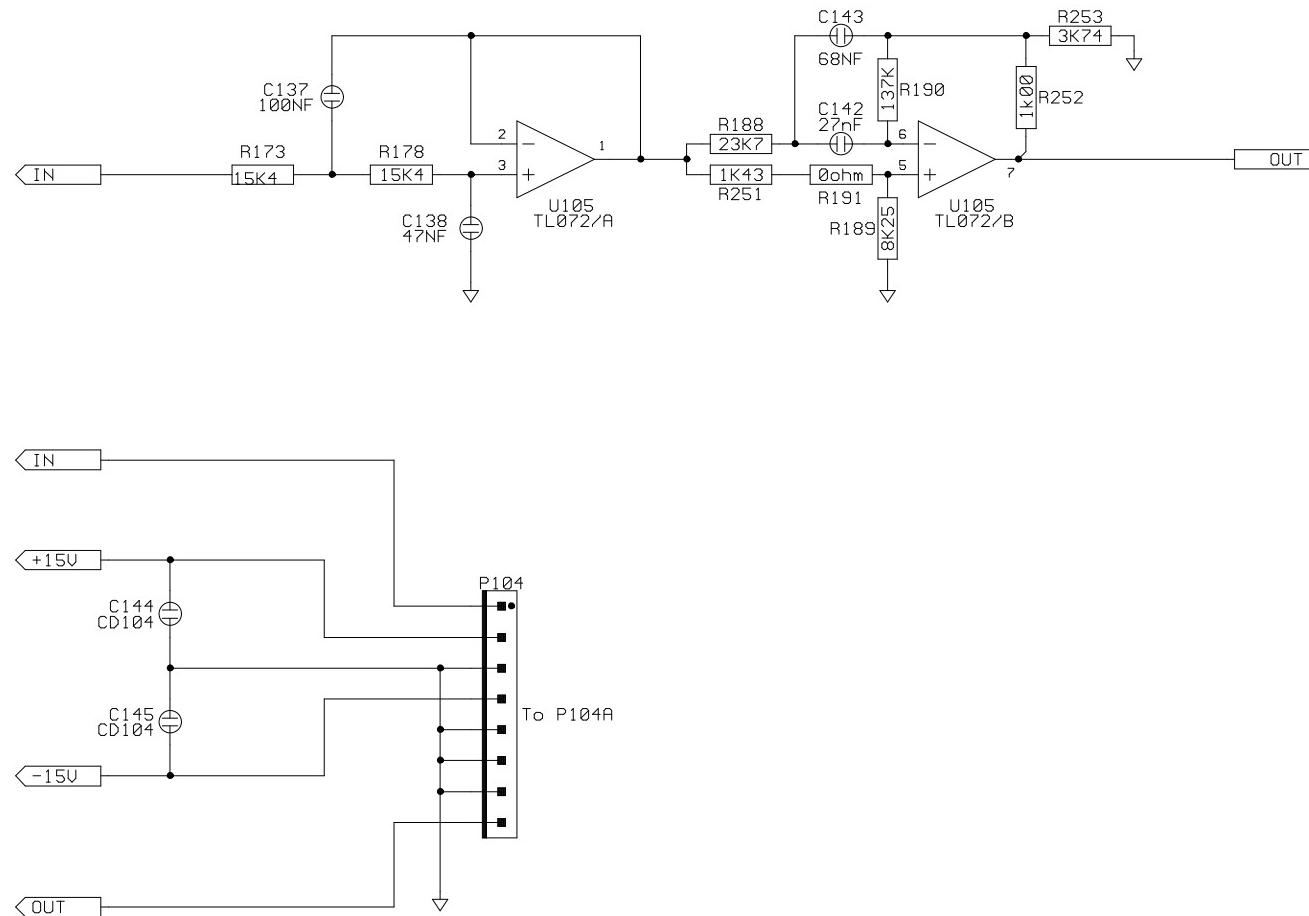
NAME :	Input/PRE	1 / 10
MODEL :	ES150P/U(ML)	REV:X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



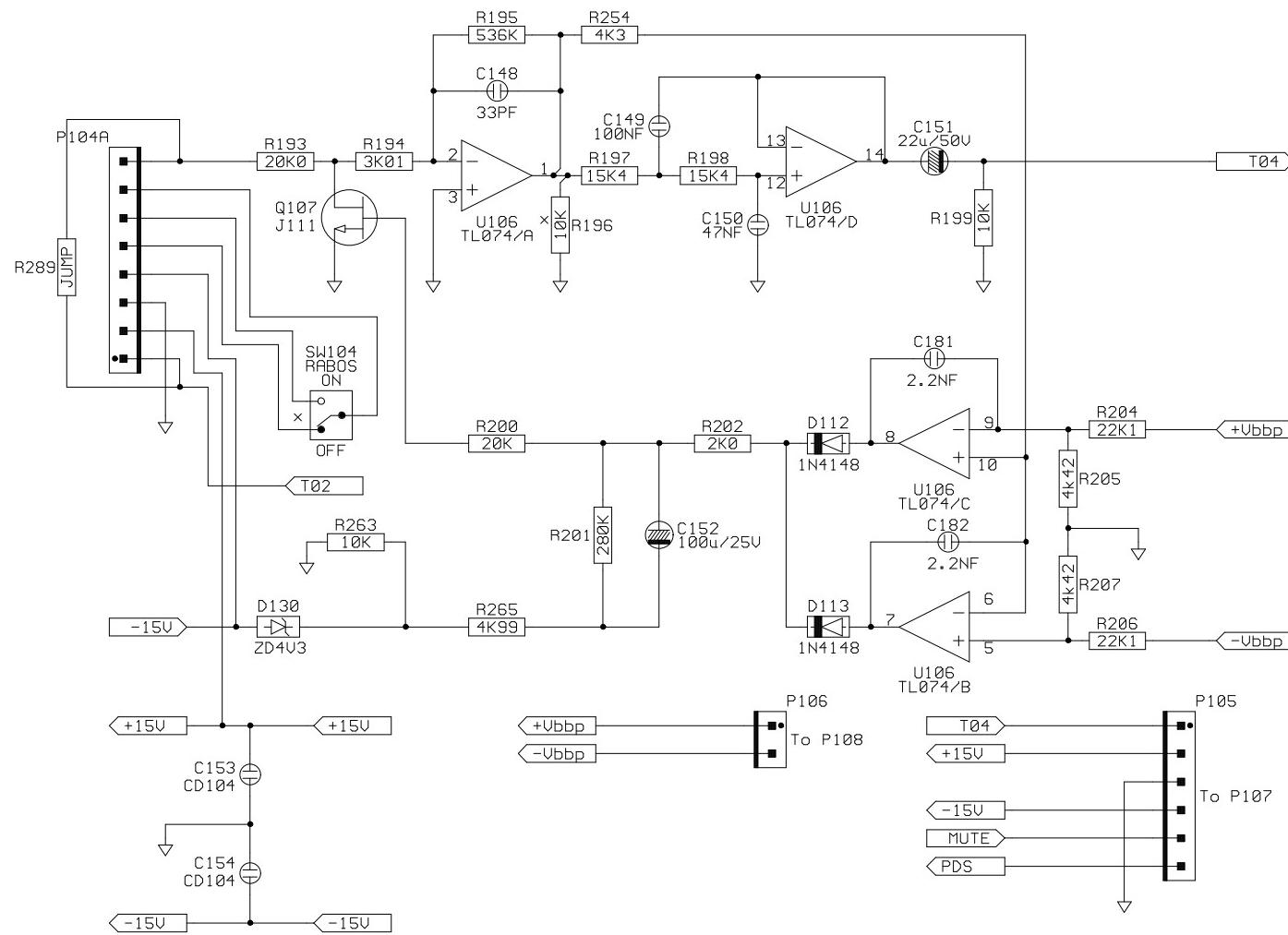
NAME : Filter/PRE	2/10
MODEL : ES150P/U(ML)	REV:X0
CUSTOMER : JBL	
DATE : 2007-03-08	
APPROVE BY	CHECK BY
	DRAWING BY



NAME : Auto on/PRE	3/10
MODEL : ES150P/U(ML)	REV:X0
CUSTOMER : JBL	
DATE : 2007-03-08	
APPROVE BY	CHECK BY
DRAWING BY	



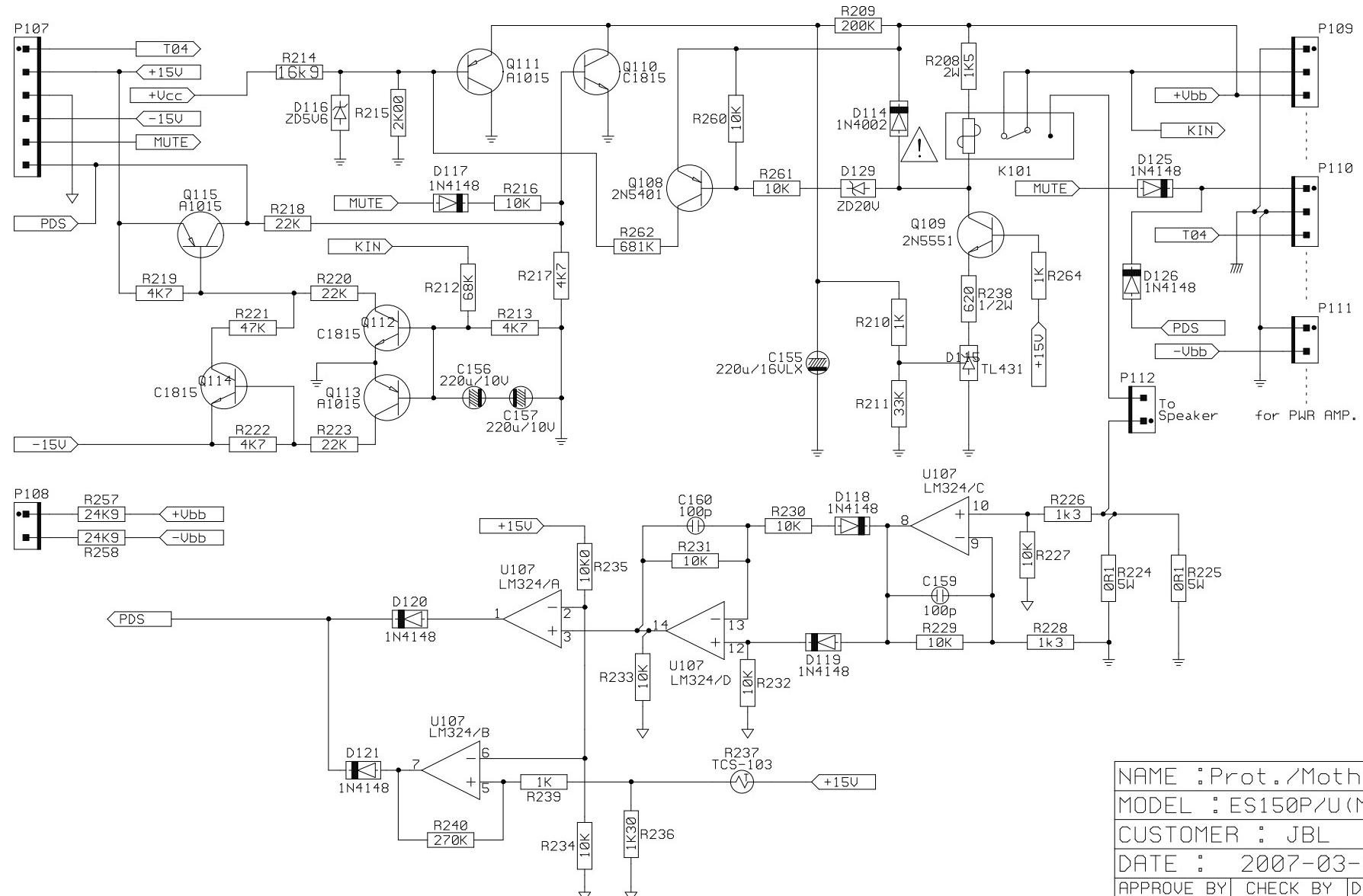
NAME :	EQ CIRCUIT	4/10
MODEL :	ES150P/U (ML)	REV: X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



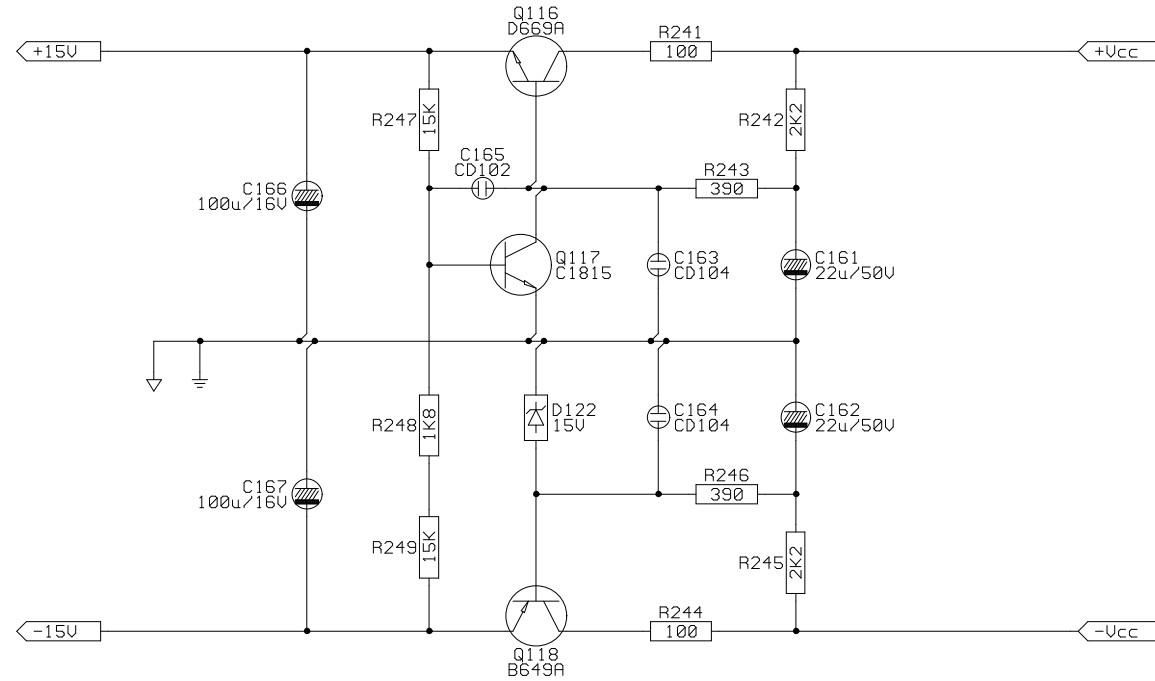
NAME :	Limiter/PRE	5/10
MODEL :	ES150P/U (ML)	REV:X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY

# ES150P

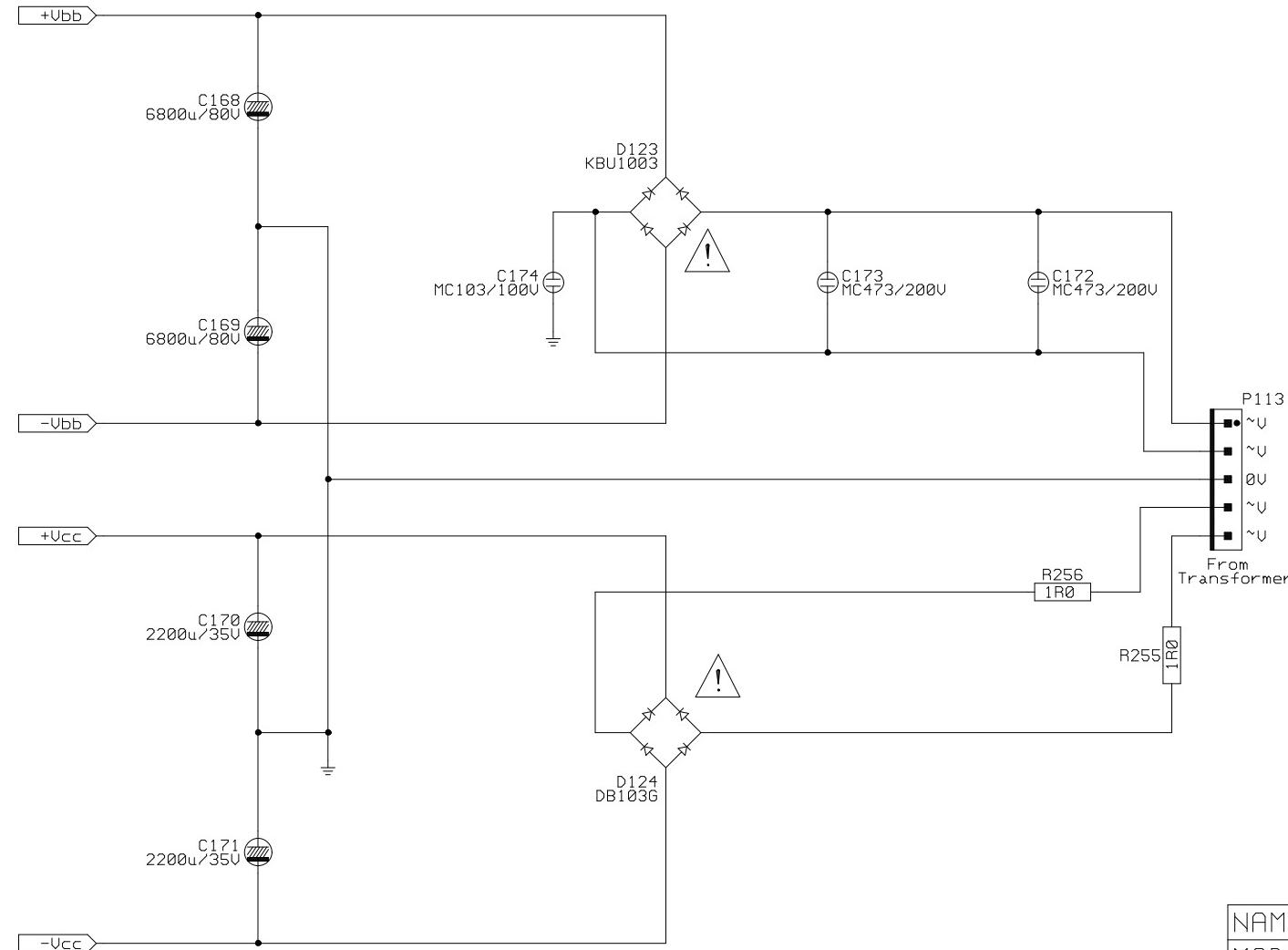
JBL



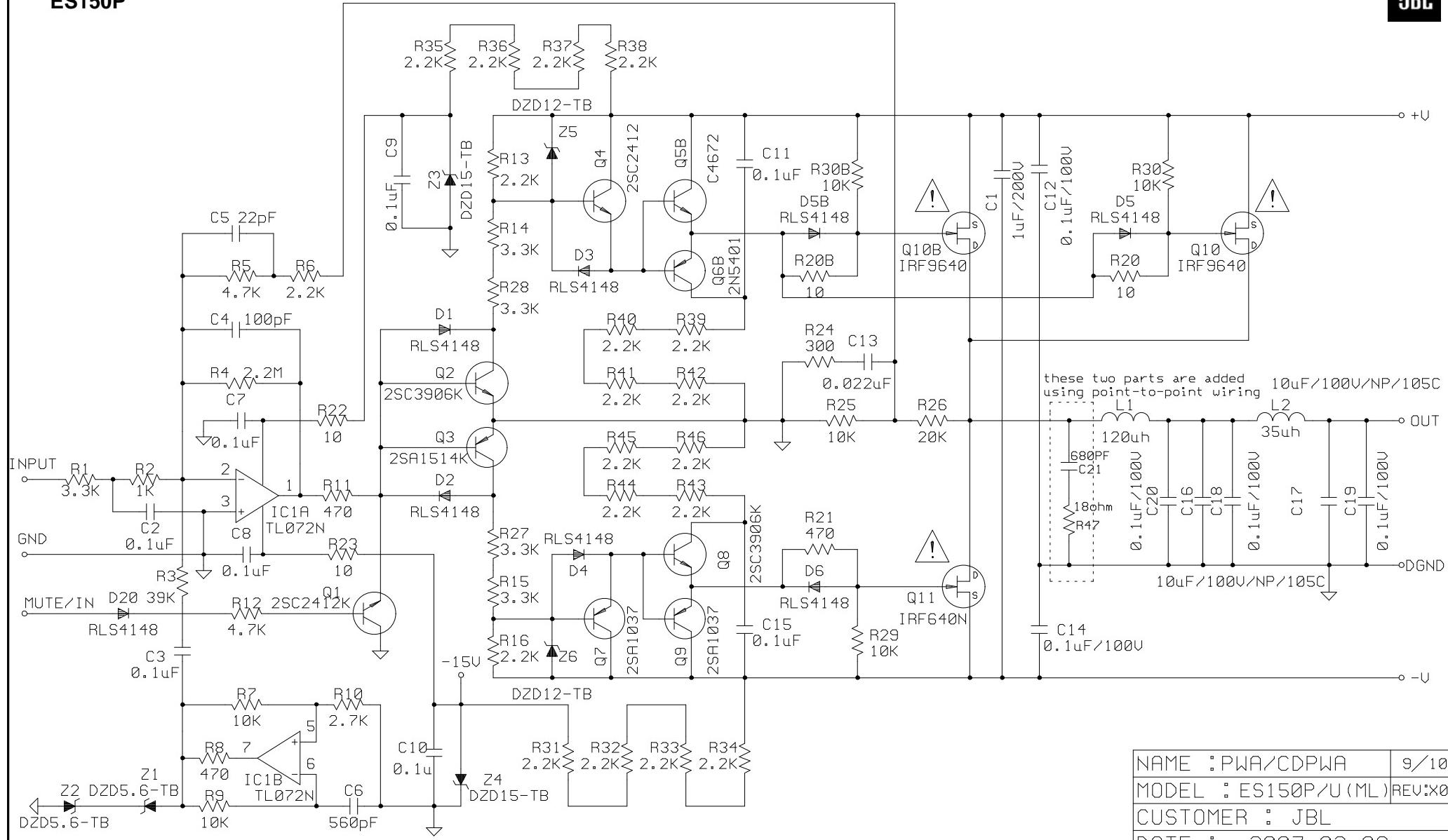
NAME :	Prot./Mother	6/10
MODEL :	ES150P/U (ML)	REV:X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



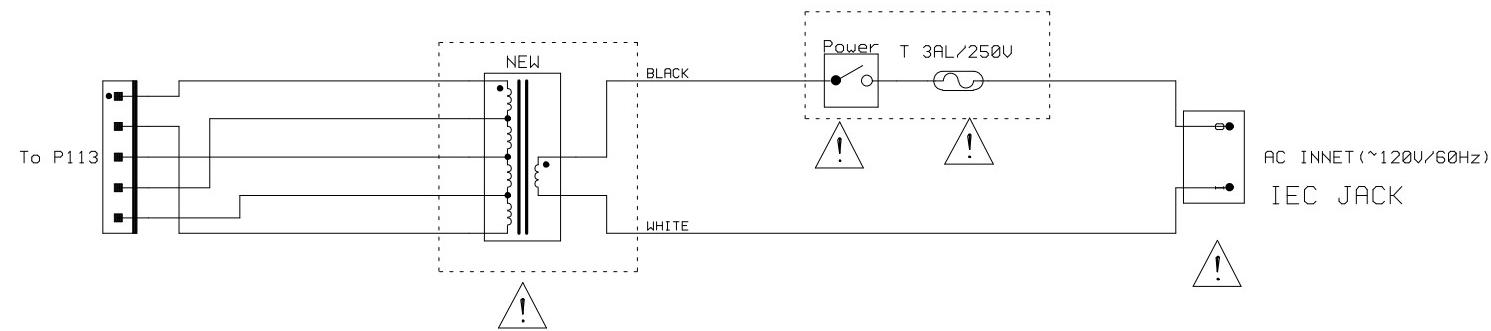
NAME :	PN15V/Mother	7/10
MODEL :	ES150P/U (ML)	REV: X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



NAME :	DCPWR/Mother	8/10
MODEL :	ES150P/U(ML)	REV:X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



NAME :	PWA/CDPWA	9 / 10
MODEL :	ES150P/U (ML)	REV:X0
CUSTOMER :	JBL	
DATE :	2007-03-08	
APPROVE BY	CHECK BY	DRAWING BY



APPROVE BY	CHECK BY	DRAWING BY	NAME : AC INNET	10 / 10
			MODEL : ES150P/U (ML)	REV: X0
			CUSTOMER : JBL	
			DATE : 2007-03-08	